View metadata, citation and similar papers at core.ac.uk
brought to you by CORE
provided by Calhoun, Institutional Archive of the Naval Postgraduate School

Calhoun
Institutional Archive of the Naval Postgraduate School

Calhoun: The NPS Institutional Archive

Theses and Dissertations | Thesis and Dissertation Collection

2016-09

Case analysis of the Joint High-speed Vessel program: defense acquisition

Watson, Brian T., Sr.

Monterey, California: Naval Postgraduate School

http://hdl.handle.net/10945/50506

DUDLEY KNOX LIBRARY

Calhoun is a project of the Dudley Knox Library at NPS, furthering the precepts and goals of open government and government transparency. All information contained herein has been approved for release by the NPS Public Affairs Officer.

Dudley Knox Library / Naval Postgraduate School
411 Dyer Road / 1 University Circle
Monterey, California USA 93943

http://www.nps.edu/library

NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

JOINT APPLIED PROJECT

CASE ANALYSIS OF THE JOINT HIGH-SPEED VESSEL PROGRAM: DEFENSE ACQUISITION

September 2016

By: Brian T. Watson, Sr.

Advisors: Charles Pickar
Brad Naegle

Approved for public release. Distribution is unlimited.

THIS PAGE INTENTIONALLY LEFT BLANK

REPORT DOCUMENTATION PAGE			*Form Approved OMB No. 0704–0188*
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington, DC 20503.			
1. AGENCY USE ONLY *(Leave blank)*	**2. REPORT DATE** September 2016	**3. REPORT TYPE AND DATES COVERED** Joint applied project	
4. TITLE AND SUBTITLE CASE ANALYSIS OF THE JOINT HIGH-SPEED VESSEL PROGRAM: DEFENSE ACQUISITION			**5. FUNDING NUMBERS**
6. AUTHOR(S) Brian T. Watson, Sr.			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey, CA 93943-5000			**8. PERFORMING ORGANIZATION REPORT NUMBER**
9. SPONSORING /MONITORING AGENCY NAME(S) AND ADDRESS(ES) N/A			**10. SPONSORING / MONITORING AGENCY REPORT NUMBER**
11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government. IRB Protocol number ____N/A____.			
12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release. Distribution is unlimited.			**12b. DISTRIBUTION CODE**

13. ABSTRACT (maximum 200 words)

In response to a shifting National Military Strategy that renewed the focus of combat operations on smaller, projectable, and dynamic joint fight entities, both the Army and Navy reviewed requirements to address capability shortfalls in either their force structure or operational warfighting concepts, or both. Both services' initial capability reviews resulted in a series of Advanced Concept Technology Demonstrations (ACTD) designed to explore the military utility of converted commercial, high-speed, shallow-draft vessels as a materiel solution.

This case study investigates the use of the ACTD to support the requirements generation and validation processes, the extent to which Army transformational and mobility factors drove the requirements process, whether or not changes in logistic support plans for Joint High-Speed Vessel (JHSV) impacted Army mission capabilities, and ultimately if these considerations led to a successful joint service acquisition of the JHSV. For both services, the ACTD supported the requirements process but it also presented new challenges in the approach to a joint materiel solution that would satisfy operational needs. That approach prioritized, validated, and incorporated competing operational requirements into a final and unique materiel solution for a system capability that is fielded.

14. SUBJECT TERMS Advanced Concept and Technology Demonstration (ACTD); Department of Defense (DOD), Theater Support Vessel (TSV), command, control, communications, computers, Intelligence Surveillance and Reconnaissance (C4ISR), Joint High-Speed Vessel (JHSV), Global War on Terrorism (GWOT), Civilian Mariners (CIVMAR), Contract Mariners (CONMAR), Military Sealift Command (MSC), Joint Capability Integration and Development System (JCIDS), Program Executive Office (PEO), Reception Staging Onward Movement and Integration (RSOI)			**15. NUMBER OF PAGES** 77
			16. PRICE CODE
17. SECURITY CLASSIFICATION OF REPORT Unclassified	**18. SECURITY CLASSIFICATION OF THIS PAGE** Unclassified	**19. SECURITY CLASSIFICATION OF ABSTRACT** Unclassified	**20. LIMITATION OF ABSTRACT** UU

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. 239-18

THIS PAGE INTENTIONALLY LEFT BLANK

Approved for public release. Distribution is unlimited.

CASE ANALYSIS OF THE JOINT HIGH-SPEED VESSEL PROGRAM: DEFENSE ACQUISITION

Brian T. Watson, Sr., Evaluator/Test Manager, U.S. Army Evaluation Center

Submitted in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE IN PROGRAM MANAGEMENT

from the

NAVAL POSTGRADUATE SCHOOL
September 2016

Approved by: Charles Pickar, Ph.D.

Brad Naegle

Rene Rendon, Ph.D.
Academic Associate
Graduate School of Business and Public Policy

THIS PAGE INTENTIONALLY LEFT BLANK

CASE ANALYSIS OF THE JOINT HIGH-SPEED VESSEL PROGRAM: DEFENSE ACQUISITION

ABSTRACT

In response to a shifting National Military Strategy that renewed the focus of combat operations on smaller, projectable, and dynamic joint fight entities, both the Army and Navy reviewed requirements to address capability shortfalls in either their force structure or operational warfighting concepts, or both. Both services' initial capability reviews resulted in a series of Advanced Concept Technology Demonstrations (ACTD) designed to explore the military utility of converted commercial, high-speed, shallow-draft vessels as a materiel solution.

This case study investigates the use of the ACTD to support the requirements generation and validation processes, the extent to which Army transformational and mobility factors drove the requirements process, whether or not changes in logistic support plans for Joint High-Speed Vessel (JHSV) impacted Army mission capabilities, and ultimately if these considerations led to a successful joint service acquisition of the JHSV. For both services, the ACTD supported the requirements process but it also presented new challenges in the approach to a joint materiel solution that would satisfy operational needs. That approach prioritized, validated, and incorporated competing operational requirements into a final and unique materiel solution for a system capability that is fielded.

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY LEFT BLANK

LIST OF FIGURES

THIS PAGE INTENTIONALLY LEFT BLANK

LIST OF TABLES

THIS PAGE INTENTIONALLY LEFT BLANK

LIST OF ACRONYMS AND ABBREVIATIONS

ACTD	Advanced Concept Technology Demonstration
AoA	Analysis of Alternatives
AMCB	Army Marine Corps Board
ATEC	Army Test and & Evaluation Command
BCC	Battle Command Center
BCT	Brigade Combat Teams
C2	Command and Control
C4ISR	Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance
CIVMAR	Civilian Mariners
CJCS	Chairman, Joint Chiefs of Staff
CONMAR	Contract Mariner
CONUS	Continental United States
COTS	Commercial-off-the-Shelf
CRAF	Civil Reserve Air Fleet
DOD	Department of Defense
EPF	Expeditionary Fast Transport
GAO	General Accounting Office
GWOT	Global War on Terrorism
HSV	High-Speed Vessel
ILS	Integrated Logistics Support
IPT	Integrated Product Team
JCIDS	Joint Capabilities Integration and Development System
JHSV	Joint High-Speed Vessel
JLOTS	Joint Logistics over the Shore
JTTP	Joint Techniques, Tactics and Procedures
LCU	Landing Craft Utility
LMSR	Large, Medium-Speed Roll-on/Roll-off
LOTS	Logistics over the Shore
LSV	Logistics Support Vessel

MFE	Maneuver and Fires Effects
MOG	Max on Ground
MRS BURU	Mobility Requirements Study, Bottom-up Review Update
MRS	Mobility Requirements Study
MSC	Military Sealift Command
MTM/D	Million Ton Miles per Day
MTW	Major Theater War
ORD	Operational Requirements Document
PEO	Program Executive Office
RSOI	Reception, Staging, Onward Movement and Integration
SBCT	Stryker Brigade Combat Team
SPOD	Sea Port of Debarkation
TRADOC	Training and Doctrine Command
TSV	Theater Support Vessel
T&E	Test and Evaluation

EXECUTIVE SUMMARY

The Joint High-Speed Vessel (JHSV) program started as an Advanced Concept Technology Demonstration (ACTD) that explored the military use of commercially produced high-speed catamarans originally designed and used to ferry cars and supplies in the region around Australia.

The original ACTD experimented with High-Speed Vessel (HSV) X1, named *Joint Venture*, specifically because of its subsequent use by the Army and Navy as a demonstration of an existing commercial technology to be converted for military use. During the Navy lease period, HSV *Joint Venture* was used as a command and control vessel for five other vessels that comprised a mine warfare readiness group. HSV *Joint Venture* was fitted with a helicopter landing pad on its aft end and it supported Navy special operations missions as well. During the Army lease period of HSV *Joint Venture*, logistical experiments and military combat operations were executed from the Persian Gulf in direct support of Operation Iraqi Freedom.

The success of the initial experiments with HSV *Joint Venture* provided the proof of principle for leaders of both services. As a result, three additional vessel leases for technology demonstrations were initiated. First, the Army leased the Theater Support Vessel (TSV) named *Spearhead*, for logistical, tactical, and special operations missions. Second, the Navy's lease of HSV *Swift* was used to further demonstrate capabilities for mine sweeping and mine clearing support operations. Third, the Marine Corps chartered the *Westpac Express*, another high-speed catamaran, to use as a high-speed connector to demonstrate sea base-to-sea base and sea base-to-shore movement of personnel and supplies.

TSV *Spearhead* was the Army lease that further investigated Army sustainment and operational combat capabilities. It was used in a combat support role for Operation Enduring Freedom and demonstrated its utility in support and sustainment operations specifically related to the Army's Title 10 water transport role.

The Navy and Marine Corps experiments focused on the conduct of missions in support of the Navy's Sea Power 21 Vision, which consisted of three distinct components: Sea Strike, Sea Shield and Sea Basing (Clark, 2002). One of those components most relevant to JHSV, Sea Basing, establishes and utilizes seaborne platforms from which the Navy/Marine Corps can stage and project combat power. As a key component of the Navy Sea Basing concept, the Marine Corps leased *Westpac Express* to demonstrate principles pertaining to troop movements between power projection platforms. HSV *Swift*, the Navy's second leased vessel, was used to demonstrate its principal role in the Sea Power 21 Concept—a vision that included force protection, mine countermeasures, general fleet support, and humanitarian partnership missions.

The successful experiments and technology demonstrations that took place over a period of years provided valuable insight into the use of high-speed vessels for both tactical and logistical missions for both services. As a result, the Army campaign to reorganize and restructure its force to brigade-centric fighting entities became a priority effort directly linked to the HSV and the Army's quest to adapt its ability to project warfighting power and upgrade its watercraft fleet. Department of Defense (DOD) directives under statutes in the U.S. Title 10 law require the Army to provide logistics support over the shore in joint operations using its organic watercraft fleet (Joint Chief of Staff, 2000). However, given a slow and aging Army watercraft fleet, the use of high-speed vessels became a key essential element of the transformation process.

The multiple experiments that supported both Navy and Army requirements challenged the joint requirements development process as the services fought through a myriad of differences in mission focus, priorities, institutional service prejudices, and defense acquisition processes. Multiple disagreements between key materiel developers, evaluators, and integrated logistics representatives of the services became points of contention that were eventually resolved, but not easily and not without intervention from higher echelons of either or both services. Although the joint requirements process provided the framework necessary for each of the services' leadership to express and address concerns regarding the final materiel solution, ACTDs for high-speed vessels spanned nearly five years before the JHSV, known today as the *Spearhead*-class Expeditionary Fast Transport (EPF), was recognized and designated as a joint acquisition program.

References

Clark, V. (2002). Sea Power 21: Projecting decisive joint capabilities. *Proceedings* (October). Retrieved from http://www.navy.mil/navydata/cno/proceedings.html

Joint Chiefs of Staff. (2000, August 22). *Joint tactics, techniques, and procedures for joint theater distribution* (JP 4-01.4). Washington, DC: Author. Retrieved from http://www.bits.de/NRANEU/others/jp-doctrine/jp4_01_4(OO).pdf

THIS PAGE INTENTIONALLY LEFT BLANK

ACKNOWLEDGMENTS

I want to thank God for providing me the opportunity obtain a master's degree and continue to learn and grow in my career.

I want to thank my former immediate supervisor, Mr. Chris Addison, formerly of the U.S. Army Developmental Test Command, for the nomination and subsequent support that enabled me to obtain this Master's Degree in Program Management. Working through this program and managing body armor programs of high-level interest was difficult, at best. Chris Addison facilitated my success, allowing me the freedom to prioritize my efforts and work independently. I give thanks also to another former supervisor, mentor, and supervisor, Mr. Richard Koffinke, for his support of my professional growth during a time of transition in our command.

I want to thank Mr. David Jimenez, former Executive Director for the U.S. Army Developmental Test Command and former Director of the U.S. Army Evaluation Center, for his leadership and enabling the command to grow its work force and intellectual properties through training and training programs offered by the Naval Postgraduate School.

I would like to thank Dr. Charles Pickar for taking the time to coach and guide me through the development of this final product. Thought-provoking comments and inquiries allowed me to continue learning the finer aspects of defense acquisition, not just the ability to check the block and finally finish what I think will be a major achievement in my career. Thanks to my academic advisor, Professor Brad Naegle, for providing candid and wise counsel that also challenged me to perform to a higher standard.

I want to finally thank my wife of 31 years, Sondra Watson, for her support and patience. The late nights of studying and preparation for class presentations and projects, to include this one, tend to make someone either quite cranky or very tired the next day or two. She made it easier and worth the while. For my grown children, Brian II, Shanae, and Kayla, I hope I have encouraged you by setting an example that commitment to continuing education is valuable no matter what your station in life.

THIS PAGE INTENTIONALLY LEFT BLANK

I. INTRODUCTION

A. BACKGROUND

Threats to United States interests and security identified in defense planning documents were influenced by the former GWOT and the asymmetric threats it presented both here in the U.S. and abroad. For this reason, the nature of warfare made it necessary to modify the force structure and strategy. Such changes also required changes to instruments of war. Modifications in the nation's security posture were conveyed through legislation and the National Security Strategy, warranting adjustments in the focus on the strategic and operational levels of war. The National Security Strategy of 2006 drove the National Defense Strategy, which in turn, drove the National Military Strategy and the Chairman, Joint Chiefs of Staff (CJCS) priorities. These planning and guidance documents warranted an increased priority for enhancing joint operations capabilities for the Army, in particular.

Likewise, President Barack Obama's January 2012 memorandum, which identifies our strategic interest and guides our defense priorities over the next 10 years, shifts our attention to the security and prosperity of the Asia Pacific. The letter further ensures that our military is "agile, flexible, and ready for the full range of contingencies" (Department of Defense, 2012, p. 2).

The subsequent strategic guidance communicated by the Secretary of Defense in his January 2012 memorandum articulates and reflects the President's strategic direction to the DOD. It specifically states the need for a "joint force of the future that will be smaller and leaner, but agile and flexible, ready and technologically advanced. Such force will have a global presence emphasizing the Asia Pacific and Middle East while maintaining commitments to Europe" (Department of Defense, 2012, p. 5). These two documents form the basis of a national strategy and JHSV would become an integral part of that strategy.

The key CJCS priorities derived from the National Military Strategy were as follows: "(1) win the war on terrorism, (2) enhance joint warfighting, and (3) transform the force" (Rouse, 2006, p. 8). Subsets of the third priority required development of new force employment capabilities, the integration of new warfighting capabilities, and leveraging research and development efforts. The Army and Navy actions embraced these priorities by their decision to proceed with a high-speed vessel as a materiel solution. Four vessels would eventually be used by the Army, Navy, and Marine Corps to determine the necessity for a materiel solution that would become the JHSV program.

The technology demonstration of high-speed, shallow-draft catamarans started with a joint venture between the Army and the Navy. During a one-year lease of a high-speed vessel, the Navy had control of the vessel for the first period, and the Army had control of the same vessel for the second portion of the technology demonstration period. The Navy focused on minesweeping operations using HSV *Joint Venture* as a command and control vessel for a mine warfare readiness group. Results of its use and versatility in this role would later prompt another, more comprehensive Navy experiment. The Army's use of HSV *Joint Venture* was used to support actual special operations in the beginning of the Gulf War and also as proof of principle for other logistics-oriented operations.

For the Navy, the conceptual uses of the experimental HSV focused on a full spectrum of mission capabilities that included humanitarian support, use as a medical support facility (MSF), antiterrorism force protection to include maritime intercept operations, homeland security, noncombatant evacuation operations abroad, combat logistics support, minesweeping operations, and most importantly, power projection operations (Department of the Navy, 2005). As a multi-faceted and agile platform, JHSV provides both services with a unique capability from which task organized combat entities can project and employ power in a wide range of the operational contingencies referred to in the President's memo outlining strategic directions. Figure 1 is a computer-generated depiction of the experimental HSV (TSV Working Integrated Program Team [WIPT], 2005) showing a representative tasked organized configuration designed to execute missions of a specific mission profile.

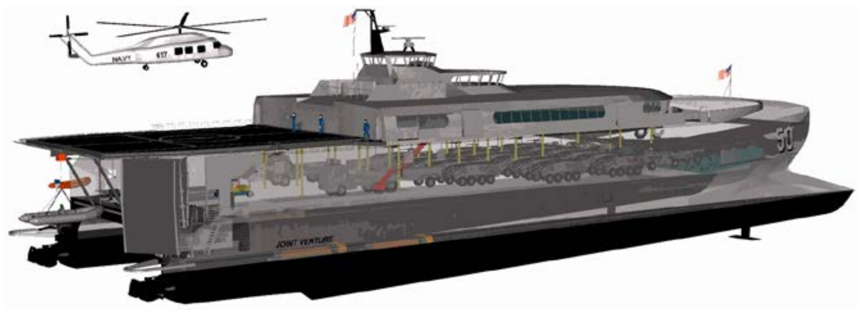


Figure 1. U.S. Navy HSV Concept. Source: TSV WIPT (2005).

In addition to these missions, the Chief of Naval Operations published *Sea Power 21*, a vision document for the Navy in 2002, which provided a more deliberate focus on the Navy's intent to transform its organization and strategy for naval warfare to one centered on increased agility and power projection. The Sea Power 21 Concept involved three components: Sea Strike, Sea Shield, and Sea Basing (Clark, 2002). According to the United States Department of the Navy (2005), experimental HSV, named JHSV after becoming a joint program, would serve as the linchpin that connects and operates all three Sea Power components. The JHSV would serve as the link or high-speed connector that moves between seaborne platforms. The use of the JHSV as a component of minesweeping defense operations supports the Sea Shield component. Finally, the JHSV would be used to impose its might through the use of combat force firepower in the Sea Strike component of the Sea Power triad. These concepts represented the transformation that would fulfill the Navy's enduring challenge to provide strategic deterrence by projecting agile, sustainable power that controls the seas. The transformation triggered a requirements review, and the review revealed the necessity for a developmental program of high-speed, shallow draft vessels (Department of the Navy, 2005). In the development of the program, the Naval Warfare Development Command (2002) adopted the vision taking steps to incorporate the principle uses of JHSV in to the materiel solution.

Likewise, operational imperatives linked to joint operations and the Army's role in supporting the National Military Strategy, merited a change in the Army force structure eventually supported by the merits of the ACTD. This experiment with commercially designed high-speed, aluminum-hull, shallow-draft catamarans revealed that the vessels could be converted for military use and significantly increase the effectiveness of both combat and logistically oriented Army capabilities to meet national defense strategy objectives at the tactical and operational levels. In their commercial capacity, the high-speed vessels were used in Australia to ferry people, cars, and other materials together.

With due consideration to how high-speed, shallow-draft vessels were being used commercially in Australia, the Army sought to experiment with the vessel and demonstrate a proof of principle for its use as an agile instrument to build, sustain, and employ combat power. These functions of building, sustaining, and employing military activity are intertwined depending on mission objective(s).

In its current structure, Army plans and capabilities for building combat power dictate a separation of Soldiers from their equipment as part of the process for the deployment and employment of combat forces. Imagine the planning and coordination challenges of having to marry Soldiers with their tanks, infantry fighting vehicles, field artillery pieces, air defense systems, shop vans, cargo trucks, towed trailers, communications equipment, large generators, and other essential combat supplies while under observation or threat of attack.

The TSV would alleviate some of those concerns and facilitate military action planning by playing a critical role in the conduct of the Reception, Staging, Onward Movement and Integration (RSOI) operation, which is a combat-building function with logistic implications (Department of the Army, 1996). RSOI is a phased operation in which combat power is built through a series of successive, and sometime concurrent, events as a component of power projection. Typically, equipment and supplies are loaded upon ships or already on prepositioned ships and sent to a sea port of debarkation (SPOD). In the reception phase, units of Soldiers are then typically flown to the airport of debarkation, and in some cases subsequently bussed to the SPOD in a theater of operations and eventually married with their equipment. The equipment is then unloaded, readied, and reconfigured for combat as part of the staging phase of the operation. This could be the most difficult and time-consuming part of the operation, which could also be subjected to a degree of risk and vulnerability for friendly forces. Often concurrent with the staging phase is the onward movement phase, where forces are marshalled and integrated or organized for battle as combat entities for combat operations. Depending upon the size and magnitude of the operation, which is also dependent on the access, number, and size of the ports, and number of transportation assets such as aircraft, ships, trucks, and trains, the RSOI process can take several days, weeks, or even months.

As another means of conducting RSOI operations or providing sustainment support operations, the Army has the Title 10 responsibility to provide and conduct Logistics over the Shore (LOTS). A LOTS operation conducts off-shore or in-the-stream discharge of personnel, equipment, and/or supplies often due to denied access to sea port facilities because of space or political challenges, shallow waters not accessible by deep draft ocean-going vessels, or when the port simply lacks sufficient infrastructure to support port discharge operations. LOTS is an Army responsibility that entails the use of resources such as floating causeways, port handling equipment, and a fleet of large and small (lighterage) vessels used as landing craft.

The sea state or conditions that affect sea swells and wave heights often hinder LOTS operations. When a roll-on, roll-off discharge facility, which is a floating pier, or a causeway cannot be established, small landing craft, referred to as lighterage, are used for loading or unloading ships and transporting their equipment or supplies between points at sea and ashore. Lighterage craft, such as the Besson Class Logistic Support Vessels, typically travel at speeds upward of 12 knots (Spearhead-Class Expeditionary Fast Transport, 2016), a relatively slow speed in comparison to the JHSV's ability to travel at speeds up to 40 knots, depending on load weight and sea state.

Given this mission requirement and a slow and aging Army watercraft fleet, senior logisticians, particularly of the Army Transportation Corps, sought to experiment with the TSV and justify its use and means to improve the efficiency and effectiveness of logistic sustainment operations as well. Experiments with the 7th Transportation Group (Composite), based at Fort Eustis, Virginia, demonstrated the vessel's ability to connect with the causeways and transfer equipment as part of a LOTS operation.

Army Maneuver and Fire Effects (MFE) personnel, formerly combat arms personnel, also sought to prove out the TSV's use as a means to employ combat power in a theater since it could operate at sustained speeds exceeding 35 knots. As part of the Army's second experiment, the TSV was outfitted with a robust Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) architecture, which permits it to accurately navigate worldwide using Global Positioning Systems. This system can also recognize friendly and enemy elements on and above the water's surface, exchange intelligence via secure voice and data transmissions, integrate operations in the joint and combined operations environments, and conduct combat planning on the move. The capability of this communications suite, coupled with the sheer speed of the vessel and its carrying capacity, would provide a combatant commander with an unparalleled and unprecedented capability to maneuver and sustain combat forces over great distances with a high degree of agility (speed), depth, and versatility—all key tenets of war.

The technology demonstrations revealed proof of principle that entire combat entities such as a mechanized infantry company, field artillery battery, or any other support unit(s) could be task organized and be employed with a high degree of efficiency to previously denied, austere, or unimproved ports. From the Army tactical maneuver and fires perspective, the C4ISR suite was one of the two critical attributes supporting the rationale for the TSV as a materiel solution. The second most compelling argument for adding JHVS came as the result of challenges, revealed in the initial Mobility Requirements Study (MRS) of 1992 and a subsequent Mobility Requirements Study Bottom-Up Review Update (MRS BURU) of 1995 which was primarily focused on intertheater lift capabilities. As a follow-on to the MRS BURU, another study and analysis that was focused on intratheater mobility was conducted and reported by GAO how lift capabilities for intratheater lift could be enhanced to add value (General Accounting Office [GAO], 1998). That report's findings coupled with yet another MRS study in 2005 refined mobility requirements (Jasmin, 2002) and eventually influenced programmatic decisions in favor of the JHSV.

The latter MRS study commissioned by the Joint Chiefs and reported by GAO in 1998, revealed shortcomings in lift capabilities while also confirming a necessity to delineate service requirements for operational level intratheater maneuver and support as mandated by law and DOD instructions. Shortfalls in capabilities became priority requirements, particularly for the Army and its need to quickly find a materiel solution to complement the restructuring of the Army warfighting organization. To do so quickly, taking advantage of technological advances and/or existing commercial solutions had to be leveraged.

This study (GAO, 1998) and subsequent papers (Crowley, 2004) also discussed and examined the extent to which high-speed vessels could reduce or mitigate the shortcomings in the Army's specific mobility requirements, given the ongoing transformation of its force structure. To that end, high-speed, shallow-draft vessels redesigned for combat or logistics-oriented missions, warranted joint consideration as a materiel solution. Equally important was that solution's subsequent ability to meet requirements for both services, although the requirements differed dramatically in some aspects.

With regard to the Army transformation of the force to lighter, more lethal, projectable combat entities, (Department of the Army, 2004) innovative methods of deployment and employment became absolute imperatives. At one point, IPT discussions indicated that the direction of the Army's evolving role crossed into the expeditionary role like that of the Marine Corps. Perhaps in a joint environment, where redundant capabilities are acceptable, this would not be a problem. Despite the relatively minor discussion of the Army expeditionary role, a compelling debate began to form in the Army between logisticians and tactical maneuver and fires-oriented leaders (formerly referred to as tacticians or those in the combat arms branches). That debate and its outcomes also drove the establishment of intraservice priorities.

From the logistician's perspective, the vessel was important because it offered a viable solution to resolve or alleviate the problems associated with an archaic fleet of watercraft approaching the end of its useful economic life. Some logisticians, transportation officers like myself at the time, viewed the JHSV as a giant step in the right direction of controlling, by a more effective means, their flexibility to conduct seaborne logistics at a much faster pace and with greater lift capacities. This position is reflected in the briefing that espoused use of the JHSV as an integral part of the Army Watercraft Fleet (USATC, 2002a). This was imperative, given the Army force structure that changed from a large, powerful, and fixed division-centric organization to a smaller, self-contained, self-sufficient, lethal, and projectable brigade-centric organization. The intent of the high-speed vessel program was intended to complement the transformation.

For both services, speed was the common denominator and true key attribute that drove the requirement for the JHSV. Speed to deploy and employ forces of sufficient size to coastal access points, and speed to provide more lift capacity over time were the most critical elements of the JHSV's added value to all services.

These factors were a paramount concern and weighed heavily in the development of Army requirements that originated in the Operational Requirements Document (ORD) and Charter for the TSV ACTD. At the inception of this idea for a military experiment or technology development involving high-speed, aluminum-hull catamarans, the gap that existed for intratheater sealift and airlift in 1995 remained problematic prior to and after the 2006 National Security Strategy was published. The TSV ORD was used to provide a framework for the ACTD program to establish performance and operational parameters (Department of the Army, 2003a).

The Analysis of Alternatives (AoA) is a phased process that investigates whether or not modifications to existing capabilities or other alternatives such as commercial off-the-shelf (COTS) or developmental materiel solutions meet a need or fill a capability gap. In this case, JHSV is a combination of a COTS item modified for military use. The Army-Navy ACTD for HSV *Joint Venture* was intended to accelerate that process with both services originally exploring the use of a commercial option to meet a military requirement. Spinoff ACTDs from the original Army-Navy joint program venture were launched by the Army (TSV *Spearhead*), Navy (HSV *Swift*), and Marine Corps High-Speed Connector. These experiments that investigated and determined military utility were important to providing vital information for the final requirements determination and materiel solution that is fielded today. Research and information contained in this project report indicates that the joint service requirements process was a continuous one, if not because of revised defense acquisition processes, then by an absolute necessity to compromise and establish competing priorities that would meet the needs of two services.

The Navy and Marine Corps experiments revealed a number of viable solutions and other key considerations for the conduct of both minesweeping and Navy logistics missions. Based on a series of continuous experiments conducted with high speed vessels over a period of at least two years, both services are assumed to have found reasonably promising results of the original and subsequent ACTDs. As a result, the JHSV program became a joint acquisition program between the Army and Navy, with the Navy designated as the lead service. After some coordination between the services that included some fundamental changes in the logistic support structure and life cycle management concept, the acquisition program became the JHSV program. Even well into the development and initial production of the first vessel, other significant programmatic changes were made regarding the operation and manning of what is now called the *Spearhead*-class EPF vessel.

The terms “TSV,” “HSV,” and “JHSV” refer to the same type platform used at different times prior to and leading up to the formal designation as a program of record. Where possible, JHSV will be used throughout the remainder of the document to avoid confusion with the platforms discussed.

B. OBJECTIVES AND RESEARCH QUESTION

The primary research question is: **Did use of the ACTD and its support of the requirements generation and validation process facilitate a successful joint service acquisition?**

The purpose of this research project is to examine how the ACTD and other individual service factors impacted the requirements process and ultimately drove the development and resolution of a unique materiel solution for a joint acquisition program. JHSV started as a technology demonstration of one materiel solution for multiple joint and individual service capabilities. The research describes the catalysts for change, individual service and joint challenges and the actions that were necessary to make JHSV a successful joint acquisition program. Research is shaped by the following:

- A shift in the National Military Strategy; corresponding changes to CJCS priorities.
- Army and Navy force reorganizations.
- Joint mobility requirements; Army intraservice capabilities of its watercraft fleet.
- Individual and joint acquisition policy.

Through this process, lessons learned will be identified to serve as a reference to other acquisition managers or test and evaluation (T&E) personnel facing similar challenges in joint programs.

With the requirements process as the focal point of this applied project, this paper will examine the initial requirements and then the evolution and prioritization of those requirements by different service processes. This paper is weighted toward Army operational considerations as it pertains to generating requirements to execute designated mission sets and the associated logistics implications.

The following secondary research questions shape the outline and body of information that support the objectives.

- How did the requirements process impact or influence defense acquisition of the JHSV from program inception to delivery/fielding?
- Were the Army transformational and mobility factors sufficient to drive the requirements process that warranted a material solution such as JHSV?
- How did changes in logistic and support plans for JHSV impact the system's mission capabilities for the Army?

C. SCOPE

This research project is intended to analyze the requirements processes for a joint program with two services undergoing transformations of both force structure and strategy in support of the national defense. Its scope will include aspects related to military utility of a COTS design for increased mobility, force projection of a transformed force structure, factors related to deployment/employment timelines, and other logistical implications.

"Mobility" is a term used interchangeably with "power projection"—a key component of the National Military Strategy and the extent to which experimental high-speed vessels, such as the commercially converted TSV, serve as the potential materiel solution. This study also reports the impact of the Army organizational changes based on its transformation to the modular brigade combat teams with organic combat service support units. To a lesser extent, the program study considers costs in terms of manpower, funding, and time, mostly for the Army.

Background materials were obtained from TSV ACTD program reports, coordination and support to action officers of Product Management Office for Army Watercraft, personal experiences with Army and Navy officials prior to commencing this joint applied project, other research papers, defense acquisition references, periodicals, Internet searches, and databases.

Definitions and concepts used in this research project are based upon DOD and Army definitions and acronyms related to aspects of acquisition management, T&E, the Army Transportation Corps, and the U.S. Navy. Definitions of acquisition and programmatic terms are provided where necessary to provide clarity and understanding. The list of acronyms is provided before the Executive Summary.

THIS PAGE INTENTIONALLY LEFT BLANK

II. SERVICE TRANSFORMATION AND REQUIREMENTS

A. NAVAL STRATEGY CHANGE: IMPACTS ON REQUIREMENTS

The transformation of the naval vision and strategy essentially mandated a commensurate change in its requirements to restore or enhance existing capabilities. “Sea-based operations use revolutionary information superiority and dispersed, networked force capabilities to deliver unprecedented offensive power, defensive assurance, and operational independence to Joint Force Commanders” (Clark, 2002, p. 1). These aspects are found in Sea Power 21 Vision—a vision of the Navy’s intent to organize, integrate, and transform the Navy, increasing its precision, reach, and connectivity to achieve sea-based operational objectives as indicated by Admiral Vern Clark. New technologies enabled new concepts permitting an improved ability to integrate communication networks from the air, land, and sea. The employment of the JHSV in its naval-specific role is a key component and combat multiplier supporting the Sea Power 21 concept.

In response to the changing paradigms for warfighting, the Navy’s Sea Power 21 plan represented the transformational concept comprised of three component parts: Sea Shield, Sea Strike, and Sea Base (Department of the Navy, 2005).

Sea Shield represents the force protection or defense capability of the entire entity. It includes the use of electronic warfare, surface, air, and subsurface protective measures and execution. The JHSV plays a role in this requirement through the use of its C4ISR architecture operating as part of a larger force. Sea Strike represents the offensive-oriented component of the fleet’s lethality and combat capability (Clark, 2002). The JHSV plays a required role in this aspect via its ability to project combat power. From a joint perspective, it is inclusive of force projection capabilities and the employment of surface and subsurface combatant ships, airpower, and ground troops. The Marine Corps represents the Navy ground combat capability.

The Sea Base concept is essentially a floating force projection platform from which combat entities in the joint force plan and project offensive combat power. A Sea

Base or floating power projection platform operating just beyond the international sea boundary provides combatant commanders with the ability to operate independently of natural physical or geopolitical constraints. This strategic and operational concept is resource-intensive, but feasible, given the attributes that high-speed vessels possess and the capabilities they provide (Clark, 2002).

Sea basing has a logistics-oriented component and JHSV's required role provides the means to sustain the force with ship-to-ship or ship-to-shore supplies and equipment over extended distances and on time. Both the Army and Navy have a key interest in the requirements to meet this capability, although the concept is framed for the Navy as an aspect of sea basing and for the Army it is characterized as a key requirement to meet its capability to execute the RSOI tasks. Both essentially reduce or eliminate the time required to execute components of off-shore maneuver and logistics-oriented missions.

As depicted in Figure 2, ForceNet integrates the components of Sea Strike, Sea Shield, and Sea Basing founded on the C4ISR architecture required to provide the operational construct and framework for effective command and control of a networked, distributed naval combat force. The concept of ForceNet and its intended use to the Navy strategy was a critical component and driver in the requirements process and establishment of priorities. The C4ISR suite was critical to the Navy's capability to maintaining situational awareness in combat conditions, accelerating the speed of decision making in such conditions, and enabling "real-time, enhanced collaborative planning among joint and coalition partners" (Clark, 2002, p. 8). The C4ISR suite was a key component which the Army and Navy agreed upon as a high-priority joint requirement for this program.

Figure 2. U.S. Navy's Operational Concept—ForceNet. Source: Clark (2002).

The JHSV, depicted as the TSV in Figure 3 (Clark, 2002), interfaces with joint formations in a sea-dominated environment or environment where operations in the littoral waters are an imperative for mission success. The conceptual depiction of the Sea Base component under ForceNet and the potential role for JHSV in that organizational design illustrates the Continental United States (CONUS) base and the JHSV requirement to self-deploy directly to a joint operations area (TSV WIPT, 2005).

Once within the protective umbrella of the Sea Shield, JHSV would operate to ferry troops/Marines, equipment, and supplies from either an Army Regional Flotilla (Fast Sealift Ships) or a Maritime Prepositioning Group of ships. The JHSV role could also directly support a carrier-based Expeditionary Strike Group by providing high-speed access for troops to shallow draft and austere ports as depicted by the potential objectives along the shore line. Satellite communications provide command and control from both CONUS and within the joint operations area. The JHSV plays a key role and is a critical enabler in the Joint Force Commander's ability to adapt and engage multiple objectives from operational levels and tactical levels of war.

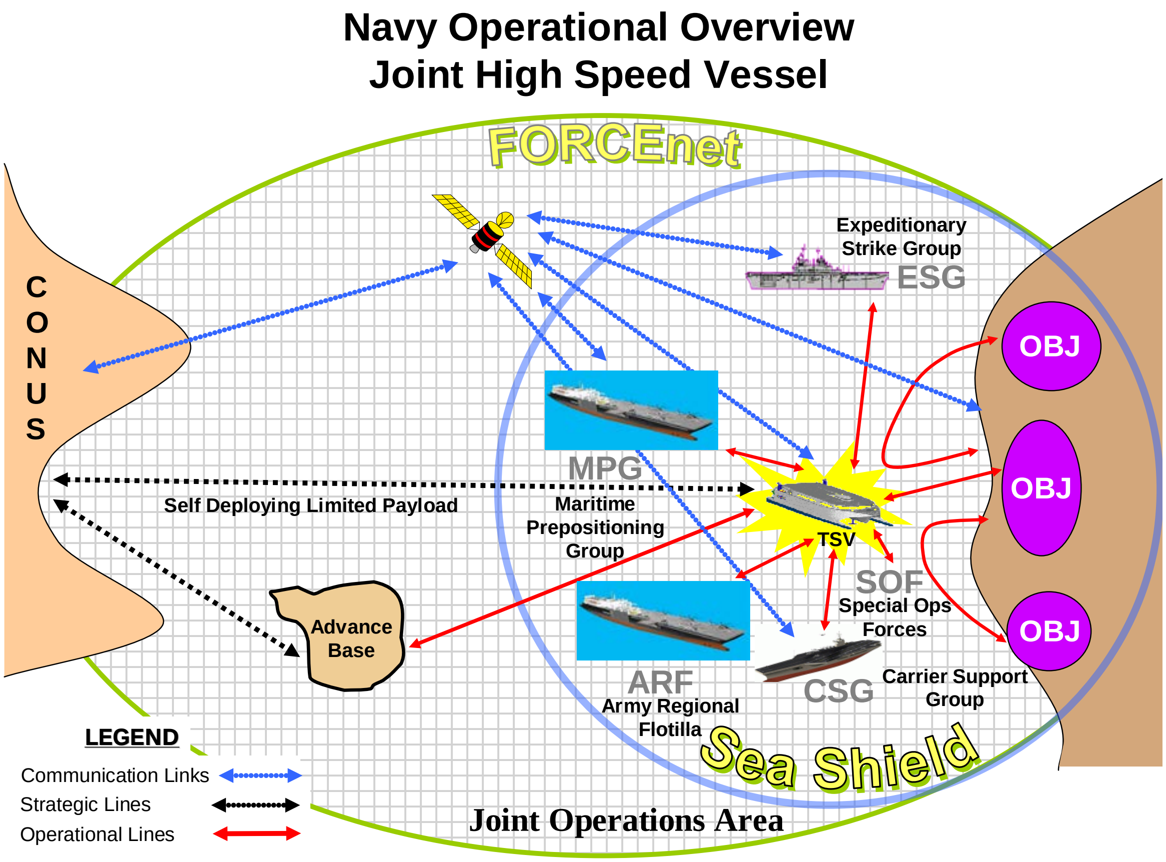


Figure 3. Navy Transformation—Operational Overview for JHSV Employment. Adapted from Department of the Navy (2005).

B. ARMY TRANSFORMATION: IMPACTS ON REQUIREMENTS

Like the Navy, the Army underwent its own restructuring and reorganization, given the National Security Strategy and an imperative to become leaner, more lethal, and more agile through technological advancements. The Army Transformation Roadmap serves as a blueprint for the Army's organizational restructuring from the legacy force design of corps-division-brigade centric combat structure depicted in Figure 4 (Department of the Army, 2005), to an objective force design comprised of the Brigade Combat Teams (BCT) as depicted in Figure 5.

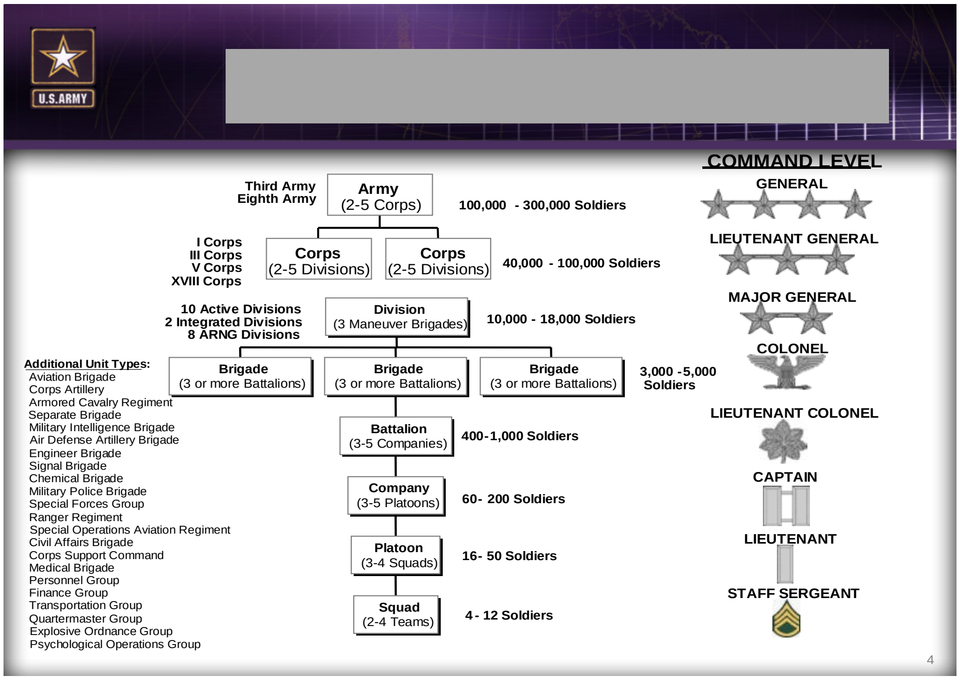


Figure 4. The Army Legacy Force Organizational Structure. Source: Department of the Army (2005).

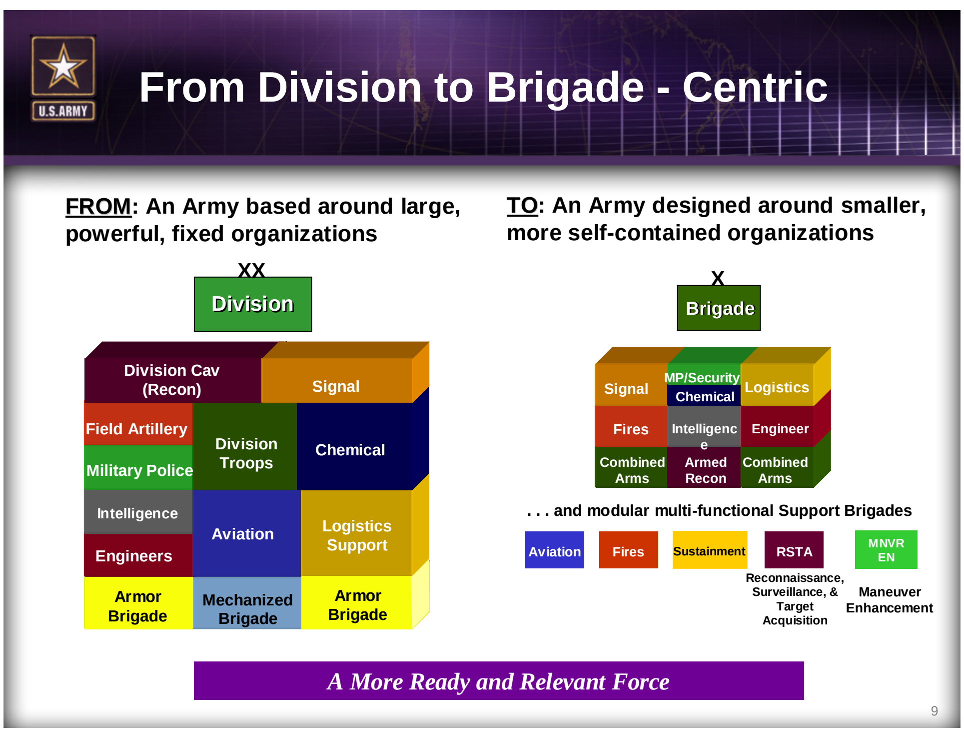


Figure 5. Army Brigade-Centric Reorganizational Diagram. Source: Department of the Army (2005).

The BCT takes much of the divisional structure and some at the Corps level, then adds in all the enablers needed to create a powerful, broad-spectrum, brigade-level unit much more capable of independent action (Department of the Army, 2005). BCTs will be permanently task organized so they require minimal, if any, augmentation. Still, like the former mechanized, armored, or light infantry divisions, flexible groupings of modular brigades are also tailored to benefit and meet specific mission capabilities. These transformational changes of the Army structure were applicable to combat, combat support, and combat service support units. These changes impacted the various uses and requirements of the JHSV in a combat or combat service support role.

The Army combat and combat service support roles for JHSV are similar to the Navy's view design and execution. However, as we weight the warfighter's perceived use for JHSV, the operational maneuver role takes on greater importance. Army ground component commanders do not expect to operate the JHSV under the force protection umbrella of the Navy in the JHSV combatant maneuver role, nor do they want to add layers of coordinating requirements. This defeats the flexibility and freedom of maneuver that JHSV provides in executing land-based combat operations injected from the seas.

The projected method of employment for the JHSV by naval maneuver commanders (PEO for Ships, 2004) indicates the vessel or vessels would operate within a joint-oriented force structure. However, in the most likely scenarios for employment by Army commanders, the JHSV will likely operate independently of any larger sea-based force, outside of the Navy protective umbrella that is defined as the Sea Shield component of the Sea Power 21 Concept. Conversely, JHSV could operate within the Sea Shield defined area as a dependent of the Navy force. Employment of the JHSV under either condition supports transformational operational maneuver by combining situationally awareness to combat ready Soldiers with their equipment everywhere in the battlespace. JHSV likewise supports transformational sustainment capabilities by streamlining the RSOI process given its ability to access and egress from austere ports, all while providing total asset visibility of supplies and equipment. These maneuver and logistic oriented capabilities addressed key and critical components of the Army's transformational objectives. Those capabilities in turn were vital and drivers to both the requirements process and the development of the materiel solution demonstrated during the course of the experimental vessel program.

1. Operational Requirements

Operationally oriented requirements were largely associated with the deployment of U.S. forces and the subsequent combat roles of the Army, specifically its ability to employ forces at decisive points and times enabled by the JHSV.

Mobility requirements, which originate at the strategic level, require the initial deployment of a "legacy" brigade combat team "wheels up" to anywhere in the world in 96 hours after notification. As a continuance of that strategic lift requirement, the Army must be able to deploy a division on the ground within 120 hours, and an Army Corps consisting of up to five divisions within 30 days (Crowley, 2004).

The analysis of the capability to meet these requirements is a measure of the capabilities against the requirement. Findings of the MRS BURU in 1995, and the subsequent MRS in 2005, indicated that there was "not sufficient lift to meet the requirement in two of the four Major Theater War (MTW) scenarios of the simulation model" (Jasmin, 2002). The extensive use of available commercial and military airlift and sealift capabilities was considered. Commercial capabilities were inclusive of foreign flag carriers for sealift and the Civil Reserve Air Fleet (CRAF) for airlift.

The DOD's original analysis yielded a requirement to move 66 million ton miles per day (MTM/D), which was two times greater than the existing capability at the time (Crowley, 2004). As a result, Congress provided a significant investment to develop what is today the C-17 Globemaster aircraft—another previous defense acquisition program. Incremental use of the CRAF in three stages and even a number of procured fast sealift ship capabilities still left the DOD short of the lift capability goals by nearly 50 MTM/D, based on a conflict with the Soviet Union. Similar calculated requirements were planned assuming two MTWs (GAO, 1998).

The airlift and sealift requirements were then further broken out using the concept of prepositioning equipment and supplies close to or within the potential conflict regions.

This concept would (1) mitigate the risk of initial forces flowing into a theater of operations and (2) alleviate the strategic lift requirement by reducing the MTM/D requirement. Specifically, MRS recommended that airlift capabilities at endstate provide a range 49.4 to 51.8 MTM/D. The analysis for sealift recommended the procurement (defense acquisition) of 19 Large, Medium-Speed Roll-on/Roll-off (LMSR) ships, some of which would be used for prepositioning equipment forward. Contract shipping requirements require a range of 6000 to 6500 20-foot equivalent containers per week plus another 13 to 16 container or breakbulk ships specifically chartered to deliver ammunition (Crowley, 2004).

With the paradigm shift in our expected future engagements and defense strategy, the strategic, operational, and tactical echelon lines are now blurred with regard to mobility requirements envisioned in the Army’s transformational roles for inter- and intratheater mobility requirements. The JHSV has a key and dynamic role in bridging or transitioning the strategic and operational or intratheater lift requirements.

The ORD for the TSV (later renamed as JHSV) was produced by the Training and Doctrine Command (TRADOC) functional systems managers. These system managers provide the Army, and in some cases, DOD, oversight and management for categories of equipment like communications, watercraft, heavy-wheeled vehicles, artillery systems, armor combat systems, etc. In the case of the JHSV, operational requirements or key performance parameters outlined in the approved document Operational Requirements Document (Department of the Army, 2003b) were as follows:

- Self-deployable over strategic distances
- Average speed of 36+ knots fully loaded
- Operational range of 1250 nautical miles
- Shallow draft not to exceed 15 feet
- Useable payload space of 1870 square feet; objective is 25–30K square feet
- Cargo carrying capacity of 1250 short tons (~ 17 M1A2 tanks)

- Cargo handling capability for containerized, palletized, and rolling stock cargo
- Passenger carrying capacity of 354 troops with combat gear

These requirements (Department of the Army, 2003b) were generated using actual information paired with existing capabilities of the commercial industry, and confirmed in a series of exercises and demonstrations that were part of the ACTD experiments here and abroad. Other requirements were derived from the National Security Strategy, National Military Strategy, and subsequent DOD directives. Specifically, the operational distances in the requirements listed above match the expected intratheater operational distances in which our combat forces would operate. The cargo carrying capacity was demonstrated, not necessarily with tanks because the ramp was a limiting factor, but with Bradley and Stryker vehicles. The troop carrying capacity aligns with an average company-sized combat element or one specifically tailored for combat. The shallow-draft requirement allows port access to a high percentage of the world's ports not readily accessible to large LMRS or other typical ocean-going cargo ships. Speed, the most important factor in the requirement, was demonstrated as reliable and effective during exercises like Ulchi Focus Lens and Cobra Gold, where the actual transport of representative size forces and equipment were moved between Sasebo, Japan and Pyongteak, South Korea.

In the joint environment of these exercises, the JHSV will have unique challenges related to command and control. It must also be capable of supporting combat, combat support, and combat service roles seamlessly. Finally, it will have to operate across strategic, operational, and tactical levels. To do so, JHSV must be able to operate in a commercial environment and a military operating environment, simultaneously. Operating in commercial or non-military environments require compliance with mandates of the Global Maritime Distress and Safety System and the Safety of Life at Sea treaties. From a joint perspective and when operating in a military environment, each service must be able to communicate effectively with the other making it necessary for the Navy's ForceNet architecture and the Army's LandwarNet command and control (C2) systems to be integrated on some level. The JHSV must also have the ability to conduct ship-borne or embarked unit battle command center (BCC) operations for enroute mission planning and rehearsals. This is all possible through the vessel's all-encompassing C4ISR suite.

The Army's Battlefield Command Systems, Global Command and Control Systems-Joint, Blue Force Tracker, are enabled by the BCC having collaborative tools that operate through wideband SATCOM. The vessel's local area network provides internal communications through an intercom system enhanced by data, voice and video-teleconferencing. The BCC in the critical component that gives the JHSV a capability to employ firepower immediately and without delay.

As defined by the initial and revised Operational Requirement Documents, the experimental TSV and the ultimate JHSV's requires an "open" C4ISR design architecture capability is supposed to support Pre-Planned Product Improvements, software security and cyber security upgrades, and the integration of specialized sensors (Department of the Army, 2003b). The design that permits these potential upgrades and modifications are intended to have a minimal impact on vessel's tactical computing environment. That means the C4ISR subsystem must have the capability to use data directly from the ship's organic sensors, including the integrated bridge system for the vessel's control, to create a tactical picture of the surrounding environment at and above the surface of the water.

2. Logistical Requirements and Analysis

Logistical requirements were driven by a number of factors that include Army, Title 10, and DOD Directives, and a comparative analysis of JHSV lift capability against the existing legacy fleet of Army watercraft and intratheater airlift capabilities.

DOD Directive 5100.01 establishes the requirements for both organic Army aviation and Army watercraft. The Joint Techniques, Tactics, and Procedures (JTTP) for Theater Distribution Responsibilities is Publication 4-01.4, and it defines the Army's responsibility to "establish and operate coastal and inland waterways" (Joint Chiefs of Staff, 2000, p. II-9). JTTP Transportation Terminal Operations described in Publication 4-01.5, directs the Army to "establish and operate watercraft along intra-theater sea Lines of Communication and inland waterways" and "equip, train and employ U.S. Army units for logistic amphibious operations in coordination with the U.S. Marine Corps and Navy units" (Joint Chiefs of Staff, 2000, p. II-8). JTTP Joint Logistics over the Shore (JLOTS) directs the Army to "provide forces for and conduct JLOTS operations" and "provide lighterage, other discharge equipment, and trained operators for use in JLOTS operations and provide common-Service assets required to supplement amphibious operations, as required" (Joint Chiefs of Staff, 1998, p. II-3). These directives establish the mandates to support the argument and requirements for JHSV as a logistical combat multiplier.

The following operational vignettes are focused on mobility at the operational level and illustrate the effects of the JHSV requirements (Crowley, 2004). Intratheater mobility capabilities for operational maneuver and sustainment are outlined in a comparison between JHSV and legacy watercraft using a notional vignette in which a Stryker Brigade Combat Team (SBCT) is employed from a distance of 720 nautical miles. As indicated by Crowley, because the JHSV travels at speeds up to four times faster than the current fleet vessels, a cost analysis and measurement of time, speed, and payload are integral and included in the analysis.

In the illustration of JHSV metrics versus legacy Army watercraft (Figure 7), a BCT or similarly structured U.S. Marine Corps combat element is employed over operational distances to conduct combat operations. Three Logistic Support Vessels (LSVs) and 20 Landing Craft Utility (LCU) vessels represent the fleet resources for equipment and rolling stock (i.e., wheeled and tracked vehicles). Since the fleet is incapable of carrying Soldiers with their equipment and supplies, the troops, referred to as "Pax" in the diagram, must then relocate to an airport of embarkation to board the flights that will eventually link them to their equipment at the destination point. The comparative fleet of 12 JHSVs were used to move the same intact BCT consisting of Soldiers and all of their equipment from the seaport of embarkation at Naha Port, Okinawa, Japan to an injection point in the vicinity of Pusan, South Korea.

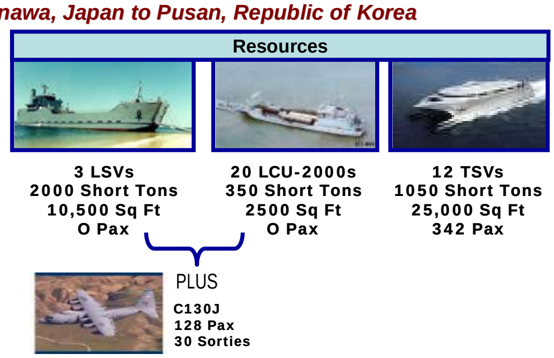
The analysis of this scenario shows (1) a greater requirement and volume of resources, (2) a greater requirement in terms of time to close the force on the objective, and (3) a greater cost in terms of dollars spent for the legacy vessels compared to the JHSV (Crowley, 2004). The total of 23 legacy vessels, plus some number of aircraft sorties to and from the equipment pick up point is substantially greater in terms of resources and time than the 12 JHSVs needed to accomplish the same mission in a faster, more efficient manner. The JHSV increases the lift capacity for equipment by greater than 50% with an added benefit of providing the same lift platform for personnel. The time savings difference of 38 days proves to be invaluable. Total cost savings using the resources identified is greater than 42% (Crowley, 2004).

To a large degree, the use of JHSV significantly reduces or totally negates the conduct of RSOI operations saving more time and effort. The cost, in terms of maintenance and additional manpower that are required to operate the other systems is apparent, but not calculated in this scenario. Figures 6 and 7 illustrate the employment timeline for a notional move of the SBCT on the Korean Peninsula.

Theater Support Vessel Metrics

vs Legacy Watercraft Movements

SBCT Sealift from Okinawa, Japan to Pusan, Republic of Korea



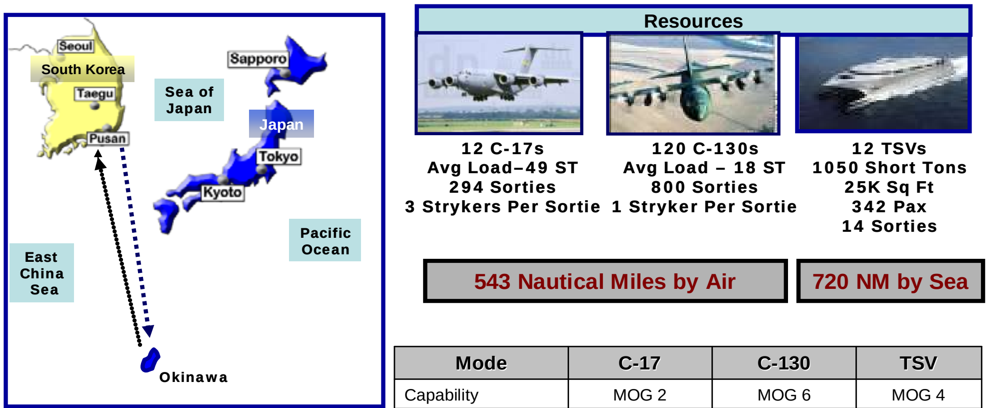
- Stryker Brigade Combat Team
- Seaport of embarkation (SPOE) – Naha
- Seaport of debarkation (SPOD) – Busan, ROK
- 720 Nautical Miles by Sea
- APOE/APOD: MOG is 4

Mode	LSV	LCU-2000	TSV
Sorties	12	81	14
Sorties Transit Time	131 Hours	131 Hours	36 Hours
Deployment Cost	$1.95M		$892K
PLUS Airlift Requirement for PAX	30 C130J sorties = $157K		0
Combined Sea / Air Cost	$2.1M		$892K
Stryker Brigade Combat Team (SBCT) CLOSURE	41 Days		2.9 Days

Figure 6. Time, Distance, and Cost Comparisons to the Legacy Watercraft Fleet. Adapted from Crowley (2004).

Theater Support Vessel Metrics
vs Intra-theater Airlift Movements

SBCT Airlift from Okinawa, Japan to Pusan, Republic of Korea



Mode	C-17	C-130	TSV
Capability	MOG 2	MOG 6	MOG 4
Hourly Operational Cost	$3,263	$1,743	$1,750
Total Operational Cost	$2.31M	$4.18M	$892K
SBCT Closure Time	12.4 Days	10 Days	2.9 Days

- Stryker Brigade Combat Team
- Seaport of Embarkation (SPOE) - Naha
- Airport of Embarkation (APOE) – Kadena AFB, Okinawa
- Airport of Debarkation (APOD) – Kimhae, ROK
- 543 NM Air

Figure 7. Time, Distance, and Cost Comparisons to the Intratheater Airlift. Adapted from Crowley (2004).

A similar analysis is conducted using intratheater airlift as the comparative platform for mobility. The same distance and notional parameters are used in this comparison to intratheater lift aircraft. Although the speed of the aircraft is much greater, this mobility platform is more constrained in its operational capabilities than either the JHSV or legacy watercraft. Unlike watercraft, aircraft require greater support for materiel or cargo handling equipment at both the ports of embarkation and debarkation. The operational costs of maintenance manhours and fuel are much higher also. The most restrictive factor, however, is the Max on Ground (MOG) number. The MOG is the maximum number of aircraft the originating or destination airfields are able to accommodate. It is often a matter of physical space to land, park, manage, and support aircraft. The size and volume of equipment being carried by aircraft also play a role in determining these factors.

Analysis of modal transportation metrics conclude that use of the JHSV, in the context of the requirements for lift capacity, speed, and operational distance, has an undeniable impact on the lift capacity and speed in which forces can be moved and sustained. A measure of the increased mobility is the reduction in time needed for material handling equipment to upload and download aircraft.

Watercraft increase volume at the expense of speed, while aircraft increase speed at the expense of volume. The JHSV offers an enhanced capability for both speed and volume in either a tactical or logistical context. The requirements are valid. The results of this model study, coupled with actual data collected through demonstrations during the ACTD experimental period, reinforce the value of the JHSV using a comparative analysis of time.

Despite the speed of individual airlift sorties, 12 JHSVs conducting 14 sorties could transport the SBCT in 3 days as opposed to the 12.4 days it would take 12 C-17s to complete 294 sorties (Crowley, 2004). The same source indicates that using the smaller C-130 intratheater airlift platform, it would take 120 C-130 aircraft nearly 800 sorties to complete the move. The MOG factors are relative in their use for airports in the vicinity of Kimhae, South Korea. The MOG varies in number based on the physical dimensions of the aircraft used. The MOG shown for the JHSV equates to the number of fixed military pier spaces. In littoral combat or sustainment operations, that number is limited by a combination of coastal space and austere ports and quay walls where the JHSV is able to download ashore. Even when the JHSV travels a lesser distance, it still outperforms the aircraft by a significant margin in both total operational cost and time.

Additionally, there is a benefit of relieving the burden of the demands for intratheater airlift—a premium asset. In virtually every exercise in which an experimental TSV has participated during the ACTD, the cost savings realized by the reduced requirement for airlift is a critical benefit to logisticians and MFE personnel alike.

When making the transition from strategic lift to operational intratheater lift, the JHSV, in its role as a logistics support platform, still provides significant savings in cost, time, and effort to LOTS operations. Using the same operational area of South Korea in a scenario where LOTS operations have to be performed to download and transport prepositioned equipment and supplies, the JHSV's capabilities are unmatched by current legacy watercraft in the Army inventory (Crowley, 2004).

An analysis of the time and resource requirements of in-the-stream discharge or LOTs operations in the vicinity of Incheon is shown in Table 1. Repositioning of an entire SBCT is considered, given favorable weather and sea state conditions. Please note that such operations are manpower intensive and time consuming to establish, operate, and close. Those factors are not considered in the timelines in Table 1.

Table 1. Watercraft Transport Time Analysis. Adapted from Crowley (2004).

Resource	Transport Time (Days)	Vessels Used	Individual Sorties
TSV	4	6	20
LSV/LCU 2000	17.2	3/20	95
LMSR w/o Port Access	7.7	1	1

Table 1 clearly shows that significant savings in terms of tangible resources, cost, and time are provided through the use of the JHSV. This operational vignette is a notional depiction of the vessel's capability using known and estimated data on the requirements for the JHSV and existing transportation lift assets. Whether aircraft are used singularly or in combination with sealift platforms, the JHSV provides a critical capability to mitigate risk to the timing of landing initial forces. This capability is paramount to Combat Commanders and the success of both operational and logistics-oriented missions. With regard to off-shore missions under the Army RSOI operation or the Navy Sea Basing concept, the JHSV provides the necessary intratheater continuum (from strategic to operational lift) and dynamic flexibility.

The key analysis focuses on the impact of the transformational Army structure and the SBCT in particular. Strategically, the SBCT could not, in most cases, meet the initial 96-hour deployment timeline despite an approximate 50% reduction in the weight requirement for movement. An SBCT deployment would take 5 to 14 days, depending on the point of origin and the destination. When the restructured SBCT consisting of 19-ton armored vehicles is compared to an armored brigade equipped with 68-ton Abrams tanks and 33-ton Bradley Fighting Vehicles, the difference and impact on transportation lift requirements are obvious.

For intratheater movements, the ORD calculates that 12 JHSVs will move the combat power of a single SBCT; each JHSV will move the personnel and Stryker vehicles equivalents of two companies. That would entail 300 Stryker armored vehicles and nearly 3,900 troops. The movement of the SBCT is further facilitated by its ability to quickly upload and offload the JHSV with 3 days of supply. Conversely, a heavy armored brigade combat team would take days to draw an abundance of fuel and ammunition before commencing combat operations.

III. PROGRAM MANAGEMENT ANALYSIS

A. ACQUISITION PROCESSES AND REQUIREMENTS

Every single-service, joint, or multi-service acquisition program is governed by legislation, regulations and policies that govern the management of that program. The effectiveness of the IPT in its management of the program as it relates to matching requirements with capabilities ought to first examine guidelines that direct the acquisition processes that drive the requirements processes—first from an individual Army service perspective and then from the joint acquisition process standpoint.

Systems built from “scratch” require developmental testing which is the verification/validation of technical parameters using such quantitative methodologies as modeling and simulation, for example. After completion of developmental tests, operational testing is conducted to determine the capabilities and limitations of the system under the conditions which it is expected to perform (Department of the Army, 2002). Planning and coordinating the T&E of systems is first and foremost dependent upon the missions for which the system is being developed. In the case of the TSV, developmental testing equates to an existing capability, effectiveness, and acceptability of commercial standards to meet military requirements. In this situation, the ACTD sought to eliminate or reduce risk through the conduct of experiments similar to a combined developmental/operational type of test. The ACTD was funded and managed accordingly (Deputy Undersecretary for Defense, Advanced Concepts and Systems, 2002).

Acquisition-related procedural changes or methodologies are mandated by either U.S. law or the ever-present and increasing need to streamline the procurement process and get equipment to the field faster and with greater efficiency. This acquisition process includes T&E. The commissioned study of the Defense Acquisition Reform Act that was conducted post-World War II and the subsequent Presidential Blue Ribbon Defense Panel Report forced a re-evaluation of the processes by which defense acquisitions are made for national security (Bair, 1994). The findings require a charter to eliminate duplication of efforts in research and development, procurement, and supply. The panel report and acquisition reform shaped the basis for change to the structure of the Acquisition Corps and its processes that were split into separate but related areas of acquisition and T&E. Borne from this report was the advent of an independent T&E activity for each of the service components: Army Test and Evaluation Command (ATEC), Navy Commander Operational Test and Evaluation Forces, Air Force Operational Test and Evaluation Center, and Marine Corps Operational Test and Evaluation Activity.

In light of the requirement for each service component to have an independent T&E agency, processes and objectives of such activities vary just enough to cause cultural service conflict within the DOD. Such conflict and short- or long-term resolutions must be addressed to serve the interest of national security. The Defense Acquisition Reform Act established the background by which defense acquisition changes were developed and implemented for both materiel development and T&E agencies.

As the ATEC's System Team Chairperson responsible for the T&E development and execution of the TSV ACTD and subsequent JHSV program of record, I experienced and learned of unique insights of the management of both programs firsthand. For the Army, common core procedures were followed and included the review of requirements for testability and evaluation of the system's capabilities.

The study on the *Transformation of Army Test and Evaluation* (Brown, 2004) discusses significant organizational and procedural changes to "independent evaluations" for developmental systems. Despite the improved planning and execution of independent developmental and operational tests and evaluations, some disconnects and inefficiencies still exist within the materiel acquisition process. This report indicates that perhaps like a similarly suggested evolution in the joint acquisition processes, which include T&E, there ought to be a likewise or at least a collaborated change within the Army Service Component acquisition processes.

The study by the Army War College on *An Evolving Joint Acquisition Force* recognizes that recent major conflicts such as Operations Desert Storm/Shield and Iraqi Freedom mandate an evolution in joint warfighting doctrine (Jennings, 2004). Under current worldwide demands and U.S. military presence, no service can operate independently. The inherent requirement of all services mandates self-examination of policy and procedures that support the warfighter in the areas of research and development, T&E, and ultimately procurement. Component services must have and act according to a holistic view of the national defense strategy without undue compromise to specific service mission requirements. Therefore, the prospect of “reorganizing the acquisition community into a truly joint DOD organization that integrates and serves all component services should be explored.” (Jennings, 2004, p. 1). Representation of material developers and testers is proposed at high levels within the DOD and Joint Chiefs of Staff (Brown, 2004).

In the case of the individual technology demonstrations by the Army, Navy, and Marine Corps, compliance with the acquisition principles outlined by the Blue Ribbon study and other guiding references was followed.

With regard to whether or not the Army used the processes to sufficiently drive the requirements, the answer is a resounding “Yes.” The MRS study revealed and confirmed that the impact of the TSV on inter-theater and intratheater movement is essential to both the aircraft lift and sealift capabilities (Jasmin, 2002). The Army transformational and mobility factors were sufficient to drive the requirements process that warranted a material solution such as JHSV. Proof of principle on a smaller scale was demonstrated in several exercises and real-world actual missions involving troops and equipment movements over various distances.

For the Army, the process related to using logistical data was relatively straightforward and unassuming. The United States Army Transportation Corps was clear about the positive impact the JHSV would have on the fleet and the Army’s ability to conduct logistics support as required by Joint Operations statutes and directives.

The Army Transportation Corps arguments, which greatly supported the requirements of the JHSV as the platform for providing operational logistical support, were absolutely compelling. Its assessment and support of the MRS study and findings eventually carried more weight than those arguments presented within the Army by that segment focused on the warfighting capabilities of the JHSV. Specific requirements regarding payload, decreased mission time over distance, and access to austere ports for the delivery of personnel, equipment, and supply were well founded (USATC, 2002a).

Strategically oriented requirements were largely associated with the deployment of U.S. forces, and the subsequent direct combat-oriented requirements were largely affixed to the employment of combat forces in the theater of operations for the Army and Navy (including Marine Corps). The weight of what was initially to be a supporting argument for the JHSV became the critical focus of the Army's Watercraft and Restructuring Plan (USATC, 2002b).

An assessment by the Army Chief of Transportation concluded that divesting Army watercraft is an all-or-none proposition and key to consideration of the program requirements by both Army and DOD (other service) senior leaders (Department of the Army, 2004). The Army Transportation Chief intended to convey a message that DOD cannot divest the intratheater lift mission under the assumption that a force structure, in times of declining resources for all services, would be re-allocated as a higher Army priority or redefined as a Navy-only mission. This position, widely accepted by logisticians and specifically, the Army Transportation Corps, was borne of the perception that once fielded, the Army priority for use of the JHSV would be much lower than initially intended (Mulcahy, 2005). In being responsible and meeting the statutory and doctrinal requirements, the Army leadership fought and eventually prevailed in making a case to prioritize the JHSV as an absolutely essential requirement under Army control and as a vital part of its watercraft restructuring plans. Emphasis to sustain the DOD drive toward this materiel solution was highly encouraged based on substantive reports, indicators, and analysis

To do otherwise would adversely affect intratheater lift capability of the existing watercraft fleet and the ability of the service to sustain its current structure given the fleet's approach to the end of its economic useful service life between 2013 and 2018. An analysis of the cost factors of maintaining the old fleet or acquiring new capabilities also weighed heavily in supporting arguments to sustain requirements and the drive toward the JHSV as a solution for the Army watercraft mission sets. Otherwise, the Navy would have to assume all current Army watercraft doctrinal roles and responsibilities, to include cost. This was a daunting proposition—one that neither service was interested in entertaining. As a full-service watercraft provider, the Navy would have to be willing, prioritized, and funded, and allocated or re-allocated a force structure to do so effectively. Currently there is no resident port management for tugs and heavy lift crane operations in the Navy. To add that capability to the Navy would necessitate wholesale changes to the delineation of joint service missions.

Previous mobility studies spurned by the Quadrennial Defense Review (Rumsfeld, 2001) and conducted in 1992, 1995 and 1998 indicated that there were still significant shortfalls in Army intratheater airlift and responsiveness (GAO, 1998). A Government Accountability Office (GAO) audit confirmed the assessment, giving more impetus to the JHSV materiel solution (GAO, 1998). Also associated with the force structure impacts was the issue of manning the vessels with civil maritime crews, Military Sealift Command (MSC) crews, reservists, or active duty personnel. Vessels operated by the Navy typically operate with a greater number of personnel that includes commissioned officers. Manning for Army vessels typically consists of significantly smaller crews commanded by warrant officers. The personnel structure with regard to manning the vessels became an important aspect of the negotiations, but not necessarily a contentious point.

B. RESOLVING COMPETING INTERSERVICE REQUIREMENTS

Where two services are concerned, the challenges of determining, establishing, and satisfying all requirements can be much more daunting. In this JHSV program, competing and somewhat divergent service needs and JHSV capabilities made the process difficult but not insurmountable. Because the requirements for each service were valid, legitimate, and necessary, both the Army and the Navy found it difficult to argue against the other's position on these matters. This became a critical concern that would need compromise and the interjection of a joint body to resolve the conflicts. Differences in how this acquisition would be managed became a point of contention.

Challenges arose when the results of the Army requirements process conflicted with the results of the requirements process of the Navy. For example, the manning structure for a Navy vessel is different than the manning structure for an Army vessel, using the same process to arrive at a different conclusion.

Between 2001 and 2003, three separate but related experiments concerning the use of high-speed, shallow-draft vessels were ongoing: the Army's TSV ACTD, the Navy's experiments with HSV *Swift* (for minesweeping operations), and the Marine Corps lease of a High-Speed Connector for troop movements. SOCOM used a second Army-leased vessel (HSV 1X) for both experiments and actual combat-related missions.

All three of these technology demonstrations supported the doctrinal use, mission, and focus of the respective service. Still there was conflict in finding some agreeable commonality in the vessel design. In an attempt to sort through the differences, the Army Marine Corps Board (AMCB) was convened to review data and information collected during numerous experiments up to that date (AMCB, 2003). Discussions centered on the JHSV employment in accordance with the Navy's Sea Basing Concept under the Sea Power 21 Vision and the Army's Force Projections imperatives. Discussions also confirmed that this commercially based, high-speed vessel technology could be integrated and adapted to provide unique and diverse military capabilities. At its end, the AMCB recommended a joint program founded on a Common Operational and Organizational Plan that provided a single, interchangeable solution for both services' needs. As a consequence, Program Executive Office (PEO) Combat & Combat Service Support and PEO Ships signed a Memorandum of Agreement (MOA) to establish an executive steering committee that would coordinate and oversee high-speed vessel development and production.

In January 2005, the MOA, which was developed as a collaborative effort under the direction of the IPT chair, established a balanced approach to development of a joint, multiservice program. The MOA gave credence to the effort since it was agreed upon by the Army and Navy Acquisition Executives. This effort also led to the revision of requirements as the former governing document, the ORD, was transitioning into the formal Joint Capabilities Integration and Development System (JCIDS) process. The

JHSV program lead was assigned to and managed by the Navy's Project Manager Ships (PMS) 325, to leverage the Navy's core competency in ship acquisition. PMS 325 is a program office under PEO Ships and it is responsible for managing the design and construction of support ships, boats, and crafts. To some, the decision for PMS 325 to manage the JHSV program was interpreted to mean other services would essentially lose the ability to influence the outcome of the ship's design. With the decision to assign the JHSV program to the Navy, Army program managers feared that the Army's operational requirements for the vessel would not receive the proper considerations and place at risk its Title 10 logistical responsibilities to the joint service environment. Some thought Army requirements and mission-essential needs would become an afterthought, and that there would be little or no return on the Army's investment in the ACTD. That fear or assumption was not necessarily accurate since the requirements-related actions of all stakeholders were used to establish the foundation with a joint perspective on prioritizing needs. This action would help to reduce program risk while also addressing operational gaps in the context of both service's needs.

Program management meetings conducted in the Integrated Product Team (IPT) construct were held to first establish ground rules (a charter). The charter would provide purpose and function to the group, focusing on how to meet or negotiate differing or sometimes conflicting requirements for both services. For example, the Army did not want a helicopter flight deck because it would increase the manpower and distribution of required onboard military occupational skill sets. Many Army rotary wing pilots were also not qualified to perform sea-based deck landings. Therefore, the helicopter flight deck yielded two unintended consequences for training and operations. The Navy considered a helicopter flight deck to be vital to its core operations and more importantly, movement within the Sea Power 21 concepts. The differences in Army or Navy processes and priorities were identified and discussed to provide a common understanding and set the conditions to negotiate programmatic specifics.

Not everyone in the Army advocated the JHSV as a materiel solution and many in the Navy considered this another vessel. As a result, the Army would be forced to simply follow the Navy's lead without along without objection. That perception is a service bias, real or perceived, that initially adversely affected the working relationship between service action officers and program managers. The process adequately defined the requirements by laying a foundation for defining the ultimate materiel solution that was delivered.

C. HUMAN SYSTEMS INTEGRATION

Logistics for this JHSV program had peculiar differences and processes between the Army and Navy. Programmatic issues pertaining to requirements challenged the leadership. Manning authorizations are mandated and proportioned by the service component. Therefore, any significant increase in manpower requirements, particularly in light of existing recruitment and retention challenges, could have in fact, jeopardized the acquisition program or some aspect thereof. In the case of the TSV ACTD program, the Army initially planned to transfer the LSV crew of 31 personnel to the TSV. The technological differences in communications and navigation systems, the operation of self-defense systems, and propulsion engineering system improvements required a more robust crew with greater redundancy. The size of the crew has yet to be determined or cost analyzed in its entirety. This very topic will cause some level of consternation between branches within the Army if personnel authorizations cause a reduction or shift in other military occupational skill authorizations.

PMS 325 initially headed the program that eventually transitioned under the control of PMS 385. Two years after the JHSV passed Milestone B, the third Integrated Logistics Support (ILS) Summit was held in June 2010. Prior to this time, a tug-of-war ensued between the services and even within the program offices of the Navy. The Army MFE personnel and logisticians struggled over the primary use and employment of the vessel. Logistically, there were significant differences between how the services planned and managed life-cycle costs and integrated logistics.

The ILS Summit III, therefore, began by establishing ground rules that would guide the program strategy forward and as comprehensively as possible. Ten fundamental rules were established, but four of those rules were critical to a positive ILS-related outcome for all stakeholders.[1] The first such rule stated that all ILS products would be developed and delivered in accordance with the baseline configuration and policies. Affixing the ILS efforts and products according to a baseline would be beneficial, but issues arise when there is a question of which policy—Army or Navy—would prevail.

The second rule would help clarify the latter concern of policy. It stated that the user services are the ultimate customers. Requirements generation for the services were different as indicated by the use of the experimental vessels leased by the Army and Navy. The Naval focus was minesweeping and the Army focus included special operations and logistics. A joint Memorandum of Understanding set the conditions for the group to work through challenges by ensuring unique processes such as type classification, materiel release, and new equipment training were adhered to in accordance with U.S. Army procedures. This memorandum is one such example used to ensure service-specific requirements and policies were adhered to without undue compromise and costs.

The third rule stated that all ILS planning efforts shall consider common support opportunities. This rule greatly affected the program costs by creating an unofficial barrier to a service's ability to introduce "nice-to-have" items (Lukens, 2010).

The fourth rule focused everyone on the common goal to deliver a safe, supportable, and suitable ship. With the delivery of the first ship to the Army in December of 2012, the first vessel has undergone a series of sea trials that was largely indicative of its success.

In a related assessment, maintenance planning proved to be a favorable strength of the program management. The maintenance concept is crucial to development of many other logistic elements including supply support, technical manuals, and training. The integrated logistics support plan was updated to reflect the JHSV maintenance concepts. Adequate planning was performed to indicate that both the Army and the MSC will have

[1] As the Army Test and Evaluation Command (ATEC) System Team (AST) Chair representing the Army's test and evaluation interest in the high speed vessel ACTD, and author of this report, the information provided herein is based on firsthand knowledge and participation in the discussions that led to these conclusions. All information provided herein is a matter of public record.

stand-alone documents developed to perform their required organizational-level maintenance requirements. In a related measure, Indefinite Delivery/Indefinite Quantity contracts for specific services were let at locations around the globe.

Common knowledge, no matter the service, indicates the supply support concept for either service clearly affects decisions related to receiving, cataloging, transferring or issuing, and disposing of spare and repair parts as a critical function. The supply support concept was poorly defined initially, but improved over time with discussion on several areas of concern including use of readiness-based sparing, single life-cycle supply support methodology, and life-cycle support of supply documentation for each component. With implementation of Performance Based Logistics (PBL) beyond what was identified previously in a preliminary list, PMS 385 later transferred many of the logistics functions to include aspects to common parts, to MSC. Previously, PMS 385 relied on the contractor to analyze and recommend what spares would be carried onboard the vessel. This is an area that still needs emphasis today, perhaps in efforts aimed at improving the maintenance posture via reliability growth measures.

The impacts of the man/machine interface were analyzed in an effort to determine the right mix of crew sizes and skill sets given the fundamental differences between an Army and Navy mariner. Navy crews are led by commissioned officers; Army crews are typically fewer in number and led by a warrant officer and a majority enlisted crew. This is not to say that either Service's manning methodology is less or more capable than the other, but it is a fundamental difference that challenges the manning and training issues. A finding of early assessments shared at the Summit indicated that only one-third of the Army crew will demonstrate an adequacy skill level to operate complex automation systems, technical publications, test tools and equipment, and general and complex at-sea maintenance operations (Lukens, 2010). The question is whether or not one-third is good enough in offering the requisite redundancy and flexibility to operate the vessel in under circumstances or over extended distances. In the end, the manning aspect of the JHSV for both the Army and the Navy were turned over to merchant marines/mariners under the direction of the MSC.

Finally, the issue of developing life-cycle sustainment for MSC and the Army was initially of great concern. PMS 385 is not a life-cycle program manager, but serves only during the acquisition phase of the vessel. After vessel deployment, the Army and MSC are responsible for support, configuration control, operational needs, and all activities associated with the sustainment phase of the life cycle. The other services are aware of this fact.

D. A UNIQUELY NEGOTIATED MATERIEL SOLUTION

Even under the guidance established by the AMCB, the charter of the joint IPT, and guidelines to govern human systems integration, the group could not agree on the final materiel solution. The JHSV for the Navy would look, perform, and be operated somewhat differently than the Army ship.

The Army's focus and critical need leaned heavily toward to the use of the JHSV as a logistics support platform, not a combat platform which was part of Navy experiments. The JHSV with its aluminum hull is not for use in combat or non-permissive environments. It can, however, be used by Special Forces operators in austere environments or restricted-access ports. During the Navy and Army experiments, adding some degree of armament or weaponry for self-defense was considered. The JHSV has the capacity and framework to accept any kind of weapon system, but at the expense of significantly reducing its cargo-carrying capability, and perhaps speed. The decision to arm the JHSV for the Army was essentially rejected in part due to perhaps a likewise increase in manning, and maintenance operating costs and time.

The compromise eventually became an alternating procurement of vessels. Of the 10 ships originally budgeted for purchase, the Army was to receive the odd-numbered ships off the production line (1, 3, 5, 7, and 9) and the Navy would receive the even-numbered ships (2, 4, 6, 8 and 10) (Spearhead-Class Expeditionary Fast Transport, 2016). This action, although surprising, allowed the necessary degree of trade space to meet unique requirements and capabilities needed by each service.

The solution started as a small victory for both services, particularly the Army whose fears were allayed by the notion that all of its requirements would be recognized and included in the vessel design. After vessel delivery, each service was originally responsible for manning (including training), maintaining, and providing full life-cycle support for its vessels. The first vessel, originally named United States Army Vessel *Spearhead* was originally scheduled to be delivered to the 7th Sustainment Brigade, formerly the 7th Transportation Group (Composite) at Fort Eustis, Virginia. A later change in the stationing plan called for a transfer of all JHSVs to the MSC where all vessels would be crewed by civilian sailors.

IV. SUMMARY, RECOMMENDATIONS, AND CONCLUSIONS

A. SUMMARY

This research project examined the ACTD and its impact in determining or confirming the requirements process for an eventual program of record, and it identified issues with the overarching acquisition process, and requirements-generation process within segments of the Army, the Navy, and in a joint program environment. It also identified IPT-related issues and measures taken to establish and manage a vetting process that helped to facilitate communication of each service's key requirements for a joint program under the Navy's lead for program management.

The ACTDs conducted by the services were integral to the acquisition process for this particular program and its impact on the DOD's ability to meet the warfighter's critical needs as defined by the National Military Strategy. Through a series of lengthy and multifaceted exercises and events, all services proved military utility for the vessel's intended uses in the context of that service's mission. The experiments by the Army, Navy, and Marine Corps provided proof of principle and military utility for a commercial capability. However, the experiments and the findings of each made the prioritization of requirements very difficult to determine.

When concerns arise and program management becomes more of a challenge than originally intended, a closer look at the policies, regulations, and guidelines that steer the defense acquisition process becomes necessary. Following a Blue Ribbon Panel, the DOD realized changes that streamline the process needed a review. To my recollection, the ACTD streamlined the processes identified in the Blue Ribbon report used in the lead up to JHSV as a program of record. This particular program, however, had its timeline for actual procurement extended by a number of factors that included the contract development, joint program management, and disagreements therein in the IPT. Nonetheless, the importance of the program was recognized by the senior program management leaders and conditions were established to resolve all points of contention.

Each service determined requirements based on the limited scope of its individual or service missions outlined in the National Military Strategy. The Army had a dual focus centered on operational maneuver for combat units and on logistics support. Likewise, the Marine Corps and Navy had ideas and their own narrow scope of requirements to meet their mission assignments. As the program progressed and was designated a joint program, the result of the requirements-generation process met with conflicts and there were some disconnects in the joint requirements generation. Those disconnects were successfully addressed with the use of the three-star AMCB (committee) and a charter that governed the conduct of the IPT stakeholders for negotiating and prioritizing requirements for each service variant. Although it can be argued that the ultimate decision to alternate vessels coming off the production line was not intended to change for the individual service, the same argument can be made that the conditions set by the charter and AMCB's input established an environment that yielded such a result. The unique challenges of this joint program ended with a unique solution that satisfied all stakeholders from both services, despite the difficulty in reaching that conclusion.

JCIDS is the current DOD capabilities-based requirements process. The previous requirements-generation process failed to consider new defense acquisition programs in the context of other programs, it insufficiently considered combined service requirements and priorities as part of its AoA, and it therefore failed to provide sufficient analysis. The experiences and findings revealed by the ACTD facilitated the current capabilities-based requirements-generation process.

The requirements-generation process is a testimony to its intended purpose and despite the number of self-imposed intra- and interservice challenges experienced by both services over the long life of this program, the acquisition program was successful. The requirements process positively impacted the acquisition of the JHSV. Some might view the JCIDS process as having a marginal bureaucratic impact, but the research and evidence showed that this experiment, which transitioned to a program of record, used a directive committee, the AMCB, to properly steer the procurement. It did so by setting the ground rules and facilitating the process in a manner in which both services could address their unique requirements. The JCIDS process, through its use of the Joint

Requirement Oversight Council, likewise set the conditions for a successful program, despite initial challenges caused by differing efforts and the focus of individual service experiments with high-speed vessels.

The Army's intraservice conflicts between MFE personnel and logisticians added contention to the difficulties with identifying and justifying requirements. Given the internal strife of the Army with regard to identifying and prioritizing requirements for its service, the Navy could have easily surmised that if the Army could not decide what was wanted and needed internally, how could they in good conscience convey a solid message in the joint program management environment? In a joint program environment, it is essential that requirements and priorities be deliberately well defined. The Army position was clearly weighted toward the needs of the logisticians, specifically the transportation corps, and its uncompromising battle for the Army Watercraft fleet upgrade. Even with today's standing vision of the National Strategy Imperatives which clearly focus on the Pacific Theater, there is not much of an indication that the tactical and operational aspects and requirements exercised during the experiments were high priority for the Army.

Initially, there was little evidence of truly "joint" planning among the two key participating services, the Army and the Navy. Upon transfer of the program management to PEO Ships, IPT discussions eventually led to the establishment of regular logistics meetings and routinely scheduled teleconferences. These meetings kept all parties engaged and were therefore effective in identifying and resolving issues expeditiously. They also assured all stakeholders that documents and plans were being discussed, although sometimes not easily resolved. The meetings were a major step in effectively managing the program because they provided a mechanism to raise, address, and resolve concerns. ATEC eventually dropped out as the Army's Operational Test Agency responsible for the evaluation of the JHSV, but some connections with regard to developmental testing and ILS evaluation plans remained through the third logistics summit and onto sea trials for the first and second Army vessels.

Because the issue of manning the vessels would have negatively impacted or at least caused a significant change in the force structure of both services, it became more and more apparent that MSC's use of civilian mariners (CIVMAR) would be the best solution. Arriving at that conclusion took some time, but was best for the program as indicated by a formal decision at a later date and time. Ships manned by a contract would employ U.S. citizen contract mariners (CONMAR). This action relieved Army and Navy manning issues somewhat while keeping an appropriate level of access to the JHSV as part of its joint-directed missions. Those matters related to personnel training, maintenance, and most importantly, operation of on-board systems as it pertains to maritime law and best practices also provided for the incorporation of the MSC as the system's manager and operator. The use of the CONMARS and CIVMARs under MSC was the best solution even though the original requirements did plan for the eventual outcome. Other government-owned or -leased sealift vessels fall under the control and direction of MSC. It is a rational, logical choice that JHSVs operate similarly.

Having reached a relative impasse on the logistics and manning issues related to JHSV, IPT discussions began with considerations of CIVMARs to operate some number of vessels and CONMARs to operate some number of vessels. This approach would help alleviate the issue of each service's challenge to align manpower design, i.e., rank structure and vessel crew organization, with the vessels at the time of delivery. JHSVs will be crewed by CONMARs working through private shipping companies under contract to MSC on a competitively awarded contract. "CONMARs will man/crew the ships and be responsible for virtually all aspects of on-board operations and maintenance" (Global Security Organization, 2012, p. 1). Military mission personnel will embark as required or designated based on the sponsoring service's mission(s) or task(s) (TSV WIPT, 2005).

The Army was exceptionally effective in bearing out the statistical information and research data that supported and justified JHSV requirements. Mobility factors primarily discovered or confirmed by the mobility requirements studies were in fact sufficient to justify and drive the requirements process for the JHSV from an operational perspective.

The MRS of 2005 did what it was intended to do as well—enable the Joint Chief and Services Chiefs to gain insight into the inter and intra theater lift shortfalls and capability gaps, which provided information for programmatic decisions to be made. The comparison of sealift and existing Army watercraft lift capabilities made it clear that DOD and statutory directives would in fact be at risk if those shortfalls or capability gaps were not addressed quickly. Even using what was initially thought to be a nearly impossible scenario where the nation would have to fight two major theater wars simultaneously, the analysis revealed several issues and a definite inability to meet mobility requirements. There were, in fact, two major wars taking place in Afghanistan and Iraq, but perhaps not to the magnitude defined by the simulation models. Still, the number of aircraft needed to meet the notional intratheater lift proved to be critical and was later validated by an independent review of the requirements. Intratheater watercraft lift, even when using forward prepositioned equipment and stocks, did not provide any significant difference in reducing the timelines according to the analysis. The analysis supports the integration of JHSV for lift as a means to close the gap in deployment, employment and resupply timelines over distance.

With these facts, a clear case is made with an unquestionable and rational explanation that a means to address the shortfall for intratheater lift capability, specifically through the employment of the JHSV, would make an impact in closing the capability gap using its key system attributes of both volume (lift capacity) and speed.

B. RECOMMENDATIONS

The results and lessons learned from a series of various experiments with shallow draft, high speed, aluminum hull vessels, indicated that a conversion of this commercial capability for military use was a viable solution necessary to develop further through the acquisition process. The ACTD process, by its design, accelerated the acquisition process validating its effective use in determining and developing a materiel solution as it relates to cost, schedule and performance. The JHSV, by way of the ACTD program, filled an impending capability gap for the individual Services and for joint service operations that further supported the national military strategy and related directives.

This does not mean the ACTD was without fault in some applications and management of its processes. Some problems with this program, in particular, revealed the need for a closer examination, and perhaps refinement or improvement to how

ACTDs are applied to some aspects or subcomponent parts of a particular program. One such recommended improvement recommended by GAO address shortfalls or a lack of criteria for assessing the maturity of some proposed technologies. This shortfall was not solely specific to the case in this TSV ACTD (as an overarching program); however, it may have contributed to some of the challenges that were faced with the evolving technology that governs or supports the C4ISR demands, for example. The DOD has improved its guidance regarding the maturity of the technologies, but that guidance contains exceptions that depending on the technology, could effectively hinder the goals that shorten the acquisition schedule as intended. With specific regard to the TSV ACTD, although "commercial items that do not require any further development could proceed directly to production, many ACTDs may still need to enter the engineering and manufacturing development phase to proceed with product and concept development and testing before entering begins" (GAO, 1998, p. 8).

Concerning the GAO audit of the ACTD process and its effectiveness, the Secretary of Defense should clarify the technology demonstration guidance to the Service Chiefs to "(1) ensure that the use of mature technology, with few, if any, exceptions, is a paramount consideration," (2) limit the number of prototypes to be procured to the quantities needed for early user demonstrations, and (3) ensure that the selection of the appropriate acquisition entry point is responsibly determined (GAO, 1998, p. 8). The GAO report suggests that the operational testing agencies should actively participate in the ACTD assessment process (GAO, 1998). Although this program took quite a long time to transition from the technology demonstration phases to the program of record, the use of ACTDs in determining and confirming requirement validity are useful and should be continued whenever possible. This is particularly true since it has been shown that use the ACTD concept often has a positive impact on time, schedule, and performance—all key requirements in the management of any defense acquisition project. This fact has been proven in not only the JHSV program, but in a number of unmanned aerial vehicle programs as well.

The proper application and use of ACTDs may directly impact and drive the requirements process, which includes a confirmation of capabilities, program risk reduction, and priorities for system requirements. Therefore, it is recommended that continued refinement and application of the joint requirements process continue and that the enforcement of the joint defense acquisition policy be enforced at the operator and executive levels of program management. The use of an overarching committee like the AMCB and the IPT functions where all of the stakeholder interests can be voiced and/or represented is paramount to a successful multimillion-dollar acquisition program of any nature, joint or not joint. Through the ACTD early user demonstrations, services should expect continue to gain all the necessary knowledge of the technological capabilities before entering into the formal acquisition timeline. This expectation, in turn, impacted the requirements and created a firm basis for which all could argue and defend a position. Though some may begrudge the JCIDS process and all that it entails, it was an effective process born and implemented in time to positively impact the inception of the JHSV program.

As the Army and Navy position themselves to bridge cultural differences and differences in doctrinal operational missions and employment, particularly for the JHSV or a like solution, it is recommended that programs be modified only to an extent that allows the objective system to be built to meet Army-centric operational maneuver and logistics sustainment requirements. This recommendation is critical to reducing bureaucratic procedures and maintaining programmatic flexibility. The deviation from the initial manning or crewing plans for both the Army and Navy variants is one such example where this recommendation applies.

An additional recommendation is to continue and accelerate similar joint programs. This recommendation aligns with the DOD Interim Instruction to streamline, where possible, acquisition procedures to achieve program objectives more efficiently. This instruction should not compromise the requirements process and its mandates.

C. CONCLUSIONS

Despite early and continuous challenges in determining, selecting, and prioritizing joint requirements, I consider the JHSV program to be a successful joint program. That determination is made, in part, on how well the IPT managed its way through a quandary of problems to get to its current endstate, where a significant number of additional vessels have been budgeted for procurement. The TSV ACTD and the subsequent JHSV program are success stories and proofs of principle that clearly add value to our ability to produce and provide materiel solutions. ACTDs contributed a streamlined process to the defense acquisition framework and timelines.

From the Army perspective, the intraservice struggles to determine and prioritize the JHSV's use as a logistics platform or a maneuver platform were painful but essential to the final outcome. The logisticians, namely the transporters, were adamant about the value and improved effectiveness that JHSV would bring to the Army's ability to enhance its maneuver and logistics support capabilities. Therefore, in conjunction with the Army Product Manager for Army Watercraft, a vigorous campaign to exercise those capabilities was set in motion. Although the operational control of the vessel essentially remains with the Navy via the MSC as a logistics platform, the capabilities of payload speed and agility are welcome by commanders as combat multipliers.

The requirements process and all its implications are applicable to all services and their peculiarities. The ORD, used to support and develop the Army's vision of a converted high-speed commercial vessel in its technology demonstrations, was not vetted with the other services initially. There was no previous requirement to do so. The evolution of the Mission Element Needs Statement to the Mission Needs Statement (based on singular service requirements) to the series of documents under JCIDS represents an effective approach that must continue to improve through the advent of more joint operations and the procurements that support them through the defense acquisition process. The joint requirements process and the end results it is designed to produce are more than economic matters dictated by shrinking budgets and a mandate to be a smaller and lethal joint force of the future. Since 1971, there have been no less than 14 revisions to the Defense Acquisition Processes described in the DOD 5000 series. More changes were scheduled to occur the summer of 2015. The requirements process on which our acquisition processes are linked must continue to improve the effectiveness and efficiency in what we produce and how.

The program continuation with additional purchases can also be attributed to the program success. Key points of the JHSV program are provided as follows along with a projected schedule of vessels that have been or are scheduled to be delivered. The first ship delivered to the Army is shown at Figure 8. According to Wikipedia:

The fleet of vessels have since been renamed the *Spearhead*-class EFP.

- On 2 May 2011, all Army JHSVs were transferred to the Navy.
- On 5 December 2012, the first ship in the class, USNS *Spearhead* (Figure 10), was delivered to MSC in Mobile, Alabama.
- On June 2011, Austal was awarded construction contracts for EPF-6 and EPF-7.
- On 27 February 2012, Austal was awarded construction contracts for EPF-8 and EPF-9.
- On 10 December 2012, the Navy awarded its final option under its current contract and ordered EPF-1.
- On 5 April 2013, the EPF program was added to the remit of the Littoral Combat Ship Council so that the capabilities of both ship types could be considered together.
- In 2014, the USN considered outsourcing the management of the fleet, but concluded that the ships would continue to be manned by CIVMARs.

The list of ships launched or contracted for delivery is as follows.

- USNS *Spearhead* (T-EPF-1)—In service
- USNS *Choctaw County* (T-EPF-2)—In service
- USNS *Millinocket* (T-EPF-3)—In service
- USNS *Fall River* (T-EPF-4)—In service
- USNS *Trenton* (T-EPF-5)—In service
- USNS *Brunswick* (T-EPF-6)—Launched
- USNS *Carson City* (T-EPF-7)—Launched
- USNS *Yuma* (T-EPF-8)—Under construction
- USNS *Bismarck* (T-EPF-9)—On order

- USNS *Burlington* (T-EPF-10)—On order

The Navy is expected to purchase 23 EPF vessels over 30 years. (Spearhead-Class Expeditionary Fast Transport, 2016).

Figure 8. The JHSV *Spearhead* launched in April 2012. Source: Spearhead-Class Expeditionary Fast Transport (2016).

LIST OF REFERENCES

Army Marine Corps Board (AMCB). (2003, November 19). *Army Theater Support Vessel (TSV), USMC High Speed Vessel (HSV)* [briefing slides with scripted commentary]. Washington, DC: Author.

Army Transportation Center (USATC). (2002a). Army watercraft master plan and theater support vessel information briefing. Presented at AWRP Conference. Retrieved from http://www.globalsecurity.org/military/library/report/2002/CASCOM_AWMP_and_TSV.pdf

Army Transportation Center (USATC). (2002b). *Theater support vessel: On the spearhead of Army transportation*. Retrieved from http://www.incat.com.au/domino/incat/incatweb.nsf/v-print-friendly/36BEA729A52A5A86CA2573D90019823D?OpenDocument

Bair, E. T. (1994). *Defense acquisition reform: Behind the rhetoric of reform*. Washington, DC: The Industrial College of the Armed Forces. Retrieved from www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA288662

Brown, R. L. (2004). *Transformation of Army Test and Evaluation*. Carlisle Barracks, PA: U.S. Army War College.

Clark, V. (2002). Sea Power 21: Projecting decisive joint capabilities. *Proceedings* (October). Retrieved from http://www.navy.mil/navydata/cno/proceedings.html

Crowley, J. P. (2004, May). *Does the Army need the theater support vessel? If so, how many?* Carlisle Barracks, PA: U.S. Army War College. Retrieved from http://oai.dtic.mil/oai/oai?verb=getRecord&metadataPrefix=html&identifier=ADA423287

Department of the Army. (1996). *Reception, staging, onward movement and integration operations* (FM 100-17-1). Washington, DC: Author.

Department of the Army. (2002, January). *Test and evaluation policy* (Army Regulation 73-1). Washington, DC: Author.

Department of the Army. (2003a). *Army Requirement for Theater Support Vessel (TSV)* [memorandum for commanders of FORSCOM, PACOM, EUCOM, 3rd U.S. Army, and Army Reserve]. Washington, DC: Author.

Department of the Army. (2003b). *Revised Operational Requirements Document (ORD) for the Army Theater Support Vessel (TSV) ACAT III*. Washington, DC: Author.

Department of the Army. (2004). *2004 Army transformation roadmap*. Washington, DC: Department of Defense. Retrieved from http://www.dtic.mil/futurejointwarfare/strategic/army_trans_roadmap.pdf.

Department of the Army. (2005). *The Army modular force*. Retrieved from AKO database, June 2016, https://www.us.army.mil/suite/doc/12997587

Department of Defense. (2012). *Sustaining U.S. global leadership: Priorities for 21st century defense*. Retrieved from http://archive.defense.gov/news/Defense_Strategic_Guidance.pdf

Department of the Navy. (2005). *Naval transformation roadmap*. Retrieved from http://www.navy.mil/navydata/transformation/trans-pg01.html

Deputy Undersecretary for Defense, Advanced Concepts and Systems. (2002, March). *Theater Support Vessel (TSV) Advanced Concepts Technology Demonstration (ACTD) management plan*. Washington, DC: Author.

General Accounting Office (GAO). (1998). *DOD's mobility requirements: Value of intratheater lift analysis can be enhanced* (GAO/NSIAD-98-53). Retrieved from http://www.globalsecurity.org/military/library/report/gao/ns98053.pdf

Global Security Organization. (2012, March 29). Joint high-speed vessel. Retrieved from http://www.globalsecurity.org/military/systems/ship/jhsv.htm

Jasmin, C. R. (2002). *The need for a strategic mobility strategy for the objective force*. Carlisle Barracks, PA: U.S. Army War College. Retrieved from www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA404438

Jennings, T. L., Jr. (2004, May). *An evolving joint acquisition force*. Carlisle Barracks, PA: U.S. Army War College. Retrieved from http://www.dtic.mil/dtic/tr/fulltext/u2/a424309.pdf

Joint Chiefs of Staff. (1998, November 12). *Joint tactics, techniques, and procedures for joint theater distribution* (JP 4-01.4). Washington, DC: Author. Retrieved from http://webapp1.dlib.indiana.edu/virtual_disk_library/index.cgi/4240529/FID521/pdfdocs/jel/new_pubs/jp4_01_6.pdf

Joint Chiefs of Staff. (2000, August 22). *Joint tactics, techniques, and procedures for joint theater distribution* (JP 4-01.4). Washington, DC: Author. Retrieved from http://www.bits.de/NRANEU/others/jp-doctrine/jp4_01_4(OO).pdf

Lukens, M. (2010, January 26). Notes resulting from IPT meeting regarding ILS issues resolution. Washington Naval Yard, Washington, DC.

Mulcahy, F. S. (2005, January). High-speed sealift is a joint mission. *Proceedings 131*, pp. 34–37.

Naval Warfare Development Command. (2002). *High Speed Vessel (HSV): Adaptability, modularity and flexibility for the joint force*. Retrieved from http://www.globalsecurity.org/military/library/report/2002/ConceptHSV.htm

Program Executive Office (PEO) for Ships. (2004). *Army Future Force Expeditionary Concept Diagram* [briefing modified from the working group chaired by the Test and Trials Manager].

Rouse, J. (2006). *National military strategy briefing*. Washington, DC: Directorate of Strategic Plans and Policy (J5). Retrieved from http://www.dtic.mil/ndia/2006psa_winter_roundtable/rouse.pdf

Rumsfeld, D. H., (2001). *Quadrennial defense review report*. Washington, DC: The Pentagon.

Spearhead-Class Expeditionary Fast Transport. (2016, June 5). In Wikipedia. Retrieved from https://en.wikipedia.org/wiki/General_Frank_S._Besson-class_logistics_support_vessel

TSV Working Integrated Program Team (WIPT). (2005, June). Navy transformation—Operational overview for TSV (modified briefing). Presented at Washington Naval Yard Annex, Washington, DC.

THIS PAGE INTENTIONALLY LEFT BLANK

INITIAL DISTRIBUTION LIST

1. Defense Technical Information Center
   Ft. Belvoir, Virginia

2. Dudley Knox Library
   Naval Postgraduate School
   Monterey, California